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CLEVELAND, O., NOVEMBER 12, 1891.

THE WEEK IN IRON CIRCLES.

General Features.

Quietness characterizes the pig iron markets throughout the Central West. While a moderate amount of activity still exists in Chicago, transactions now going on are mainly for small lots, large buyers having, with a few exceptions, covered their requirements well into next year. Carload orders are numerous and others ranging up to 200 or 300 tons in sizes, constitute the general run of business. Prices on coke metal remain stationary, the Northern local furnaces being still willing to make present prices cover delivery over the entire year of 1892. Furnaces south of the Ohio river occupy an entirely different position on the matter of delivery, with here and there an exception, limiting sales to April or May next. Nothing of interest can be reported regarding the Lake Superior charcoal market. Inquiries and transactions going on are but few in number. Reports are made that several furnaces which have accumulated stocks are willing to make figures of $16.75 or even $16.50, Chicago. No claim is made that even cost can be covered at these figures, but the companies making same take the position that they have an accumulation of iron, and must move it regardless of profit or loss incurred. The strong companies are not making any such figures, and will not consider anything below $17, Chicago, even in several cases maintaining firm position at $18. The situation must end in a blowing out of a number of stacks. When this end occurs prices will improve, but not before. The general outlook for trade is healthy and encouraging. There can be no question but that in many lines manufacturers will be taxed to their utmost capacity. The balance of this year is likely to show only a moderate amount of buying, as consumers always make it a point to run down their stocks of pig iron metal previous to January 1st, on account of taking inventory on that date. There is still no material improvement in the Detroit market, and while some good-sized orders are occasionally received, yet prices do not improve. On account of navigation on the lakes being so near the close, there is considerable inquiry for Lake Superior charcoal iron for Eastern delivery from furnaces that cannot ship East during the Winter at much higher rates, There is more call for first-class Ohio softeners than for some time past, but no advance in price has taken place. There has been little doing in the specialty market during the past week, and no sales of importance are reported. There was a lot of grey forge bought on basis of $9.50, Birmingham, but it is found to be an off lot, and is an indication rather of the needs of the seller than of the true market, which is about on basis of $10 for this year's delivery. While there is little buying of car wheel irons just at the moment, some contracts for cars are being let, and the situation among charcoal furnaces is such as to give them encouragement and a firmer feeling for the future—some are well sold up, while others will shortly blow out for repairs, relieving the market of this much competition, and already some small sales are reported at figures considerably above those recently ruling. There seems to be a trifle more life in the St. Louis market, but only enough to indicate that there may be better times ahead. The effect in present business is slight, as a very intense dullness still continues. Exceedingly low prices are now ruling. Some Pennsylvania irons are offered in the vicinity of St. Louis at lower prices than ever before known. Cincinnati reports that Southern coke irons have sold at a dollar per ton above the lowest prices of August. Whether the advanced prices are to be sustained will depend upon the demand entirely, as it is not the policy of Southern makers to pile their iron. The moving of the cotton crop, together with the general activity in the Southern States, renders it impossible to secure cars for prompt shipments of iron. The railroad facilities of the South are inadequate, and there is ample room for another great trunk line. Not much interest is shown in the St. Louis market. Buying for the most part seems to be carload orders and lots in small amounts, the stove works being the heaviest buyers. Prices on Southern coke irons remain about the same. Lake Superior and Southern car wheel irons are very low, but it is the general rule among the furnaces to accept orders only for immediate or early delivery.

The Local Situation.

The October shipments of ore, although freights were reasonably low during the largest portion of the month, show a great falling off as compared with the corresponding period in 1890, but the showing will be still more remarkable next month, when the returns are all in. The total lake shipments in 1891, from the opening of navigation to the first of November, are 6,017,789 tons, or a trifle more than was estimated for the entire shipping season. To these totals must be added the rail ore which, this year, is a mere bagatelle as compared with last, being, say, a quarter of a million tons, and the ore to come down by lake in November, which by the force of circumstances surrounding the vessel market, will cut no figure whatever. With a steady demand for lake carriers by the grain trade, at seven and a half cents for cereals, the corresponding lake freight from the head of the lakes is made to appear at two dollars and eighty cents. It might just as well be $2,000 as $2.80, for the reason that there is little ore to come down at any price, and that the utmost that the ore men can afford to pay is about $1.10. Thus the demand in the grain trade has almost entirely choked off the fag end of the ore season, always providing that the grain shipment continue. On the other hand, some of the ore that might be brought down at the maximum rate, above mentioned, was sold early in the season, a portion at a time when Escanaba freights were but 65 cents, and when the prospect of low vessel rates held good for the entire season. Thus the sudden vessel boom hardly affects the ore trade at all, while its influence tending, as it must, to assist in shortening the ore supply, will have a beneficial effect when the '92 season opens next Spring. If the price of the finished material had any bearing upon the primary and intermediate products, the outlook for the ore trade would indeed be gloomy. But the low price of finished iron, notwithstanding it is very evident that ore must be higher next year, and with the higher ore price must come better quotations for pig iron, unless, indeed, no pig iron should be made at all—a contingency that is not likely to happen in the face of a prosperous business the country over. Bessemer iron, which for a month or two has been the lowest on the list, is a trifle stronger, and the sale is reported at $14.45, cash at the furnace, of about 13,000 tons, for delivery running into the beginning of April. The buyers at first offered twenty cents less, but could not cover their wants at that figure. It is a matter of common talk that a man with half a million dollars could turn the market, by simply purchasing iron for that amount, for speculative purposes, and it is not unlikely that such a transaction may come to pass. Most of the stronger furnace concerns have either largely curtailed, or altogether ceased their output at the ruling prices, the losses proving too heavy further to compete with a declining market. Some little soft foundry iron is finding a market, but everything else is dull and quiet. The only exception to this general condition of apathy is the hardware trade, which reports a very good business incident to the approach of the holidays.

PIG IRON COSTS, NORTH AND SOUTH.

The Sixth Annual Report of Colonel Carroll D. Wright, Commissioner of Labor, just out, is an enchanting study to the lover of facts and figures. Especially instructive is his comparison of cost of materials, labor and all other elements, per ton of run-of-furnace pig iron (2,240 pounds) in Northern and Southern districts respectively. The Northern district includes the States of Illinois, Indiana, Maryland, Michigan, Missouri, New York, Ohio, Pennsylvania, West Virginia and Wisconsin, and the Southern district Alabama, Georgia, Tennessee and Virginia. Without going into the elaborate series of table by which he arrives at his conclusions, we present, herewith, the summary of the whole matter:

Items.	Northern District.	Southern District.
Establishments reporting the facts required for the statements below.	26	24
Cost of all materials used in these establishments	$6,387,622	$5,450,459
Cost of labor, etc., in these establishments	1,199,818	1,505,945
Cost of all elements in these establishments	7,597,540	6,956,454
Tons of product in these establishments	544,377	647,728
Average cost of all materials per ton of product in these establishments	$ 11,734	$ 8,414
Average cost of labor, etc., per ton of product in these establishments	2.204	2.341
Average cost of all elements per ton of product in these establishments	13,938	10 7 5

Prior tables show that in the Northern district the ore used cost per ton on average $4.401, the cinder, scrap, etc., $2.631, the limestone, 79.8 cents, the coke $3.014, the coal, $2.695; and in the Southern district the ore $1.513, the cinder, scrap, etc., $1.031, the limestone 70.1 cents, the coke, $3.054, and the coal $1.565. The difference in favor of the South in the cost of ore and coal is very great, a difference as far as the ore is concerned which is partially offset by its lower per cent. of iron.

Taking the average cost per ton of product, we find that in the Northern district it is, for ore, cinder, scrap, etc., $7.534, for limestone, 50.2 cents, for coke and coal, $3.698, and for all materials $11.734; in the Southern district, for ore, cinder, scrap, etc., $3.482, for limestone, 47 cents, for coke and coal, $4.462, and for all materials $8.414.

The difference in cost per ton of labor and management, between the two districts is much less than might be expected, viz.: for the labor of converting the materials into iron, $1.474; for the salaries of officials and clerks, 18.4 cents; for supplies and repairs, 51 cents; and for taxes, 3.6 cents. In the Southern district the cost for labor of conversion per ton is $1.524; for salaries of officials and clerks, 16.4 cents; for supplies and repairs, 61.4 cents, and for taxes, 3 9 cents. While individual labor in the South is cheaper, the advantage is evidently made up by smaller efficiency.

OPENING OF THE WORLD'S FAIR.

The preparations for the exercises dedicatory of the Columbian Exposition buildings, during the week of October 12, 1892, at Chicago, indicate a desire on the part of the management to afford a display at once attractive and historic. One of the chief features practically decided upon is a nocturnal procession of floats on the illuminated lagoons at Jackson Park. These floats will represent a chronological epitome of salient historical events by centuries, from 1492 until the present time. Altogether there will be between forty and fifty floats costing perhaps $700 each on an average. The last one will represent Chicago welcoming the nations of the earth. All of the boats will fairly blaze with electric lights, and thousands of incandescent lamps under the water will give them the appearance of floating on a lake of fire. It is believed that fully 500,000 people will watch this gorgeous spectacle each night from the banks of the lagoon. The speech-making, choral exercises, etc., will occur in the Manufactures Building, which will be fitted with seating accommodations for 80,000 to 100,000 people. It is now thought that from 12,000 to 15,000 troops will participate in the dedicatory exercises. The expense of the dedicatory ceremonies will approximate $200,000.

Work on the great buildings is being pushed with all possible expedition, both night and day, and there seems to be little doubt that everything will be in readiness for this great and august occasion.

CANADA AND PIG IRON.

It has been estimated that, excluding all the iron and steel entering into such products as cutlery, surgical instruments, fine edge tools and similar articles, the requirements of Canada imply the consumption annually of 1,000,000 tons of iron ore and 3,000,000 tons of fuel; and this would be the equivalent of the output of probably 30 blast furnaces. Canada produces only a little more than 25,000 tons of pig iron per annum and imports nearly 90,000 tons, of which the United States supplies the major portion. Viewing these facts, the *Canadian Mining Review* and the *Canadian Manufacturer* are urging the establishment of a charcoal iron industry in the Dominion.

The former journal estimates that the going charcoal iron concerns together with the stove foundries, consume at least 18,000 tons annually. Looking further, it finds that for steel blooms and billets there is an existing demand for 10,000 tons a year from the wire-rope makers and rolling mills. The conclusion reached is that a Siemens furnace at Toronto would supply scarcely 40 per cent. of the demand. Concerning the advantages of pig iron smelting in Toronto, the *Manufacturer* figures out that the distance from the most available ore beds is not half as great as that between Chicago and her ore sources; and the distance from the Connellsville coke ovens to Toronto is not as great as to Chicago; and Chicago has one of the very largest and most successful steel plants in the world. Says the *Manufacturer* on this point:

> It is evident that if Canada is ever to become the producer of the iron and steel which she consumes, it can only be done by such means as have placed the United States on the proud eminence of being the greatest iron manufacturing nation on earth. At it is, the system of bestowing a bonus upon the production of iron is a delusion, which has failed utterly to do what was expected of it. As it is, the duty imposed upon imported iron is for revenue only—it is not a protective duty. The only hope for the successful establishment of the pig iron industry in Canada is in increasing the duty.

We have no particular interest in the establishment of a pig iron industry in Canada, but candor compels us to say that our Canadian contemporaries are certainly on the right track for success.

COST OF BAR IRON AT HOME AND ABROAD.

From figures collected by the Commisioner of Labor, the cost of bar iron (run of the mill) in ten establishments in the United States was as follows:

Elements of Cost.	Tons of 2,240 Pounds.	
	Cost of 135,027	Average Cost of One.
Materials (net)	$3,711,780	$27.489
Labor	618,010	4.577
Officials and clerks	69,688	.516
Fuel	153,637	1 138
Supplies and repairs	114 403	.848
Taxes	7,731	.057
Total	$4,675,279	$34 625

Similar figures for four establishments on the Continent of Europe are as follows:

Elements of Cost.	Tons of 2,240 Pounds.	
	Cost of 18,762	Average Cost of One.
Materials (net)	$400,925	$21.369
Labor	37,847	2 017
Officials, clerks and taxes	7,019	.376
Fuel	7,612	.406
Supplies and repairs	13.392	714
Total	$466,838	$24.8 2

By like summaries for two establishments in Great Britain, the respective costs per ton are shown as follows: United States, $34.62; Europe, $24.88; Great Britain, $23.97. The labor cost in the United States, as will be seen, is double that in Great Britain and on the Continent. The average selling price of finished bar iron at Philadelphia in 1889 was $43.40 per ton.

J. M. GOODWIN, chief engineer of the proposed Erie Canal, and one of the leading members of the commission, died at his home in Sharpsville, on the 28th. He was born in Boston 58 years ago, and after completing a course in engineering came to Western Pennsylvania in 1874, since which time he has been closely identified with the development of the coal and iron business of Mercer county. He surveyed railroads and was an authority on all statistical information regarding freight and tonnage. He was the inventor of a number of valuable patents on coal cars and boats. His contributions to *The Iron Trade Review* have familiarized his name to our readers.

THE foreign trade of the Cincinnati factories is a very healthy one, and notably is this the case with the Egan Company, of that city. This untiring concern is meeting with an increased call for machines from the various foreign countries, almost phenomenal, in fact, from South America, Russia, Germany and England. The same company is now supplying the machinery for a technical school at Calcutta, India, and a railroad shop order for Madras. Evidence multiplies every day that the United States proposes to have its share of the trade of the distant countries, which the older countries have possessed for so long a time.

NICKEL steel has won a place in Government specifications. After the recent armor tests at Indian Head, near Washington, orders were sent from the Navy Department to both Carnegie, Phipps & Company, and the Bethlehem Iron Works, directing that all armor

under the present contracts be made of nickel steel. This means that all the armored vessels of the navy, except the Miantonomah and the Monterey, will be armored entirely with nickel steel. The Miantonomah carries Cammel compound armor, made at Sheffield.

THE movement toward winding up the affairs of the New York Metal Exchange has, we are informed by Secretary Edward J. Shriver, been formally abandoned, but after December 31st the publication of the daily reports will be discontinued. The discontinuance of the Exchange itself would not be considered a public calamity.

THE PRODUCTION OF STEEL IN SMALL CONVERTERS.*

BY M. L. CAMPREDON.

As was at first anticipated by Sir Henry Bessemer, the converter is a metallurgical apparatus of great producing capacity. Its working is not always easy, and it is scarcely capable of producing in succession metal of dif. ferent quality which will exactly respond to the end for which it was proposed. Moreover, the metal obtained is always more or less sprinkled with blisters which are often very pernicious. In spite, therefore, of the low cost of output, Bessemer steel has never been employed freely for steel castings. The same is to be said of the Thomas Gilchrist converter with dolomitic lining. It is known that, thanks to this variation in the lining of the apparatus, a complete dephosphorization can be realized of the most phosphorus kind of pig. The Thomas Gilchrist retort has been worked with success in France, England and especially in Germany, since 1880.

The Thomas Gilchrist converter would be no more suitable than the Bessemer converter for the regular manufacture of steel for castings. Moreover, to work economically these apparatus must force their production—that is to say, must melt several tons of metal at a time, and frequently repeat the process. There is no steel works capable of utilizing in proportion to its production the metal obtained under these conditions.

Small Converters.—Some years ago it was attempted to devise small converters, fixed or movable, with lateral or superficial blast, capable of melting from one to three tons of steel per operation. The converters of about one ton in capacity are the most interesting as far as concerns the always small and limited manufacture of steel castings. The existence of small converters is easily justified for various reasons. In the first place, these forms of apparatus are easily installed and inexpensive, which permits up to a certain point of their being installed almost everywhere in the town as well as in the country, and chiefly by water courses capable of working a blast engine. With certain small converters, a waterfall giving 50 horse-power is sufficient for the blast. There results from this facility of installation a kind of metallurgical decentralization, which is very desirable, and which is making progress. The intermittence of these kinds of apparatus also gives to the founder all the facilities for running off his castings exactly at the moment desired. A few kilogrammes of coke suffice for reheating the converter and setting it going. Finally, thanks to the way in which these converters have been studied, their working is sufficiently well understood to insure their acting with regularity.

The small converters are of various systems; we may cite, according to M. Knab:—Those by Clapp and Griffiths, which arrest the blast by inserting pistons in the tuyeres. These fixed apparatus have a lateral blast near the bottom of the converter. It is complained of this system of blast that it sometimes raises the steel and lets it fall again in a single mass, producing jerks and abnormal movements in the working. Those by Witnofft and Hatton and Witherow, which diminish the blowing during the running off, either by partially closing the orifice for the blast, or by completely closing it and opening an auxiliary hole of small diameter, or simply by lessening the speed of the machine. They also are fixed. Those by Dafire, Laureau, Walrand and Robert, the tuyeres of which are inclined and so arranged that at the moment of running off the metal—the converter being sloped—they are no longer in contact with the bath. The Robert converter, which realises the most practical type of these small converters employed for producing steel castings, will be described according to the published statments of M. Hallopeau and of M. Mahler. This converter is spreading rapidly in France and in Paris itself, as well as abroad. The Stenay works, which employs the Robert converter, made a striking display at the Exposition of 1889, which enabled manufacturers to see the variety of castings which may be obtained with this apparatus when it is well managed.

The Robert converter can treat from one to two tons of pig per operation to obtain in twelve or fifteen minutes 900 or 1 800 kilos. of casting steel. The retort for one ton measures 1.15 m. in internal diameter. The blast is introduced laterally on one side near the level of the bath by a series of horizontal tuyeres. High pressure blast is not required. Instead of the 150 centimeters of pressure required for the Bessemer converter, from 25 to 35 centimetres of mercury are sufficient with the Robert. The axis of the tuyeres is inclined to a certain angle in the horizontal plane. On account of this inclination the current of air sets up a gyratory motion in the metallic bath. The molecules are thus brought successively and at intervals under the action of the air. The scoria forms rapidly, and protects the upper layer of metal, which is refined gradually by a kind of inverse cementation, the oxidizing action extending from molecule to molecule to the furthest parts of the bath. The mass is not traversed by the current of air. The stirring takes place in a unique manner under the impulse of the gyrating motion. The metal is not therefore mixed with the scoria, and when it is received into the principal casting receptacle, it runs quietly and without projections, which denotes a very sound metal.

During the operation the inclination of the vertical axis of the retort is varied in order to preserve over the orifice of each tuyere the same charge of metal, while varying the pressure and quantity of air necessary for the last phases of the operation. In addition, at the moment when the retort is emptied, the stoppage of the blast is instantaneous. This is essential as much to avoid waste as to ensure the perfect regularity of the product. It is to be remarked that these arrangements may be applied to retorts of all dimensions. The work may be conducted either with an acid or a basic lining. The latter system permits of dephosphorization being realized, but it does not suit for the production of steel castings, which will be made exclusively with the acid retort.

The results given below show the degree of refining in the Robert converter. The caloric elements are burnt in the same order as in the Bessemer—silicium first, then carbon, and lastly manganese:

COMPOSITION OF THE PIG TREATED.

	Per cent.
Carbon	3.95
Silicium	2.60
Manganese	1.40

COMPOSITION OF THE METAL OBTAINED—NON-RECARBURETTED.

	Per cent.
Carbon	0.08
Silicium	0.04
Manganese	0.20

By recarburation, which is practiced with special kinds of pig, as in the Bessemer converter, steel is obtained of definite composition. In small converters it is necessary to treat pig rich in silicium and manganese. The quantity of heat liberated is considerable, and as it is applied to the fusion of the metal the result is that the latter is very liquid, so that it well fills the moulds, which is a condition very much desired, in the case of the metal of which we are speaking. The small converter may be mounted upon wheels, and after the blast is applied can be taken into the works to run the metal direct into the moulds, or preferably into the chief receptacle from which it can be poured into various moulds by means of a suitably arranged crane.

* Translated from *La Metallurgie.*

OHIO CORPORATION LAWS.*

The commendation given this invaluable work by *The Iron Trade Review*, on the appearance of the first edition, has since been emphasized over and over by actual use, in which its practical utility to lawyer and layman alike has been simply incalculable. In the admirable arrangement of the constitutional provisions and statutory regulations, it leaves nothing to be desired, while the fullness and clearness of its forms are such that persons with only a slight knowledge of the law can feel perfectly assured that so long as they adhere to the same they are proceeding within correct and approved legal lines. To this assurance may justly be added the confidence begotten of the fact that the authors are generally recognized as among the best corporation lawyers in the State, thoroughly versed in the subject of which they treat. Perhaps no better comment could be made on the value and accuracy of these forms than the fact that they have been adopted as the official forms of the State Department. Lawyers will find in this edition much of fresh matter of great value in the fact that it embraces the constitution and statutes in force up to January 1st, 1892, as well as notes of nearly 500 decisions, and many citations, while manufacturers, investors and the public generally will find in it an ever convenient guide in the important matters to which it pertains.

* OHIO CORPORATIONS, Other Than Municipal, as authorized by the Old and New Constitutions and Regulated by Statute, with Notes on Decisions and a Complete Manual of Forms for Organizing and Managing all kinds of Companies and Associations. By A. T. Brewer and G. A. Laubscher, of the Cleveland Bar. Third Edition, Revised and Enlarged. Cincinnati, Robert Clarke & Co. 1891.

Nine Months of Track Laying.

The statistics of railroad construction for the first nine months of the year compare unfavorably with those for the corresponding time of 1890. According to the *Railway Age and Northwestern Railroader*, the difference in the track laid for the two periods is about 950 miles, foreshadowing an addition to mileage for the entire current year of something less than 5,000 miles, as against 5 738 miles in 1890. This is a smaller yearly construction than has been witnessed since 1885, when the total was less than 3 000 miles, but, on the other hand, it is a decidedly better showing than the scarcely attained 4,000 miles of 1884, or in any one of the six years from 1873 to 1778, inclusive, when at no time did the yearly addition to track exceed 4 100 miles.

Moreover, railroad construction in 1891 has been well distributed among the different States and territories, and for this reason apparently not overdone in any geographical division, great or small. Of the 2 829 laid during the past nine months more than 45 per cent., or 1 297 miles were put down in the southern and semi-southern States, including with them the Indian territory and that of New Mexico. This was done in 16 States and territories embraced in the group in question, on 81 different lines of road, while for the country at large 185 lines were affected in 41 States and Territories.

Comparison by States shows that Georgia is leading, though closely pressed by the new State of Washington, and followed at no great distance by South Carolina and Pennsylvania.

Sunstruck Steel.

According to *Iron*, one of the most trustworthy of the English technical journals, the light of the sun and moon, has a very deleterious effect upon edge tools. Knives, drills, scythes and sickles assume a blue color if they are exposed for some time to the light and heat of the sun; the sharp edge disappears and the tool is rendered absolutely useless until it is re-tempered. A similar prejudicial effect has been exercised by moonlight. An ordinary saw is asserted to have been put out of shape in a single night by exposure to the light of the moon.

THE LUHRIG COAL WASHING PROCESS.

During the last few years coal mining has made it really necessary for most collieries to be supplied with good coal washing plant, and the work of the coal washing engineer has been made more difficult and complicated in proportion. Whilst formerly colliery managers built coal washing plants according to their own notions and ideas, the erection of such plants is now generally put into the hands of a coal washing specialist. A great deal of machinery for use in the mechanical separation of coal is made and sold, but the arrangement of such machinery, and the general and economical disposition of it, is generally looked upon as a secondary matter by the manufacturers. In short, there is usually a want of that systematic arrangement which would bring about a process suitable for the economical cleansing of the coal.

The perfecting of such a process has been the exclusive work of Mr. C. Luhrig during the last twenty-five years, and he has been eminently successful in England and on the continent of Europe. This process is the result of a long and varied experience with some of the most dirty coal on the continent of Europe, and is on the gradual reduction system, that is, if the washed coal is to be coked it is not all crushed up in a dirty state, but gradually broken up, the shale being automatically separated from the coal by degrees. The process essentially consists of:

Dry separation of the run of the mine, that is, the mechanical separation of the slack or dross from the lump coal. Coal which passes between the bars of a screen about three inches apart or through a reciprocating screen of three-inch to four-inch mesh, is generally treated in the washer. In many cases the lump passes on to picking and loading bands, where the shale and interstratified pieces are picked out by hand. All larger pieces of coal, when interstratified with shale or mixed with pyrites, are broken and again passed over the screens for re-separation.

Separation of the slack or dross by screening, the dross is raised into revolving screens for the purpose of sizing the coal for the production of nut, pea and fine coal.

Washing the different sizes of nut coal coming from the revolving screens, each on separate machines, so that each machine only works up coal of uniform size.

Crushing the mixed or finely unstratified coal (separated by washing from the pure coal and clean refuse), for rewashing on separate machines.

Grading the fine coal from ⅜ downward from the screen, and that carried by the water from the nut coal washers, into different classes according to specific weights.

Washing each different grade or class of fine coal, their work being perfected by the help of feldspar; this was first employed by Mr. Luhrig in coal washing machinery, and has given very satisfactory results.

The recovery of sludge, or "schlamm," which is so difficult to retain, and which often contains exactly what is essential to coking in the case of a coking coal. This is done by means of automatic and continuous sludge recovering machinery.

Filtering the water used in washing, and cleaning it to such an extent as to enable its re-use again and again.

The automatic transport of the various products, nut, pea, pearl and fine coal, also of refuse, both fine and coarse.

Recovery of bye-products, as, for instance, pyrites or brasses, which in many of Luhrig's plants pays the cost of labor.

Arrangements are also made for automatically storing a considerable quantity of coal, the hoppers being so arranged that a large quantity of coal can be loaded in a short time. The dry separating portion of the plant is constructed so as to make as little "smalls" as possible, the screening and loading arrangements being economical, efficient and automatic. The washing arrangements are such that as much clean nut coal can be extracted as possible, and that three products can be made by each machine, viz., clean nuts, seconds or nuts (finely interstratified with shale), which are raised, crushed and rewashed, and clean refuse.

In all of Luehrig's plants there is a marked desire to avoid crushing all the coal, that is, the dirty and clean coal together; this is so often done at collieries using single apparatuses. Such a system always leads to the production of a great deal of unnecessary fine or dust coal, and consequently to loss of coal in the washed out refuse; unless the coal is very finely inter-stratified it is always washed previous to crushing for coking. It should be borne in mind that it is not claimed that this is one machine suitable for every class of coal, but that it is a process which can be so arranged as to meet the requirements and local conditions of each colliery. The nature of the coal to be treated is always taken into account, also the purpose for which it is intended to be used.

This process represents the highest state of the art of coal washing, and is successfully used in England and on the Continent in treating not less than 50,000 tons of coal per day. The result of its use has been to increase enormously the value of the best coals and to make marketable coals that otherwise would not pay for the cost of mining.

We are informed by the Luhrig Coal Washing Co., of 115 Broadway, New York, that they are now erecting at the Sloss Iron & Steel Co.'s works, at Birmingham, Ala., a plant with a capacity for washing 350 tons per day of ten hours, and expect to have it in operation by December 1st, next. This plant the Luhrig Co. are erecting at their own expense for their own testing purposes, and will, by running double turn, be able to wash coal sufficiently to produce enough coke to run both of the Sloss furnaces, besides testing all coal sent to them for the purpose of determining what results can be secured. They will test, on a large scale, coal from all parts of the country, and having done so will be ready to furnish guarantees of results as to cost, reduction of ash, sulphur and loss of coal in washing.

The crowning excellence of the Luhrig system is that, under the supervision of their trained engineers, the Luhrig Co. can adapt it to every conceivable condition and requirement. Every plant erected, is built with full knowledge of the special requirements of each particular case and with definite guarantees as to improvement in quality and expense at which the same is obtained. The Luhrig Coal Washing Co. controls the American patents and is in charge of the American business, and will be pleased to correspond with any one in relation to the matter.

BESSEMER ORES IN NORTH CAROLINA.

The Bessemer City Mining & Manufacturing Co., of Bessemer City, N. C., which is developing a number of iron ore mines, as was reported in the *Manufacturers' Record*, has issued a prospectus setting forth some facts regarding its ores. These ores, being of a high Bessemer grade, are being shipped to the rolling mills and furnaces throughout Virginia, Maryland and Alabama. Nine mines of Bessemer ores on about 2,000 acres of land are owned by this company in fee. In addition, on the same property there are limestone, glass sand and gold-bearing quartz. To show the character of these ores the company gives the following analyses of carloads and 500-ton lots.

Analysis of iron ore from the Ormond mine of the Bessemer City Mining & Manufacturing Co, by Henry Thomas, Jr., chemist for Manchester Iron Co, Pittsburgh, Pa.:

	Per cent.	Per cent.
Silica	.02	.900
Phosphorus	...	.033
Iron	.63	.904
Manganese	...	.210
Lime	...	.361
Magnesia	...	.594

Analysis of iron ore from the Ormond mine of the Bessemer City Mining & Manufacturing Co., by H M. Curry, chemist for Carnegie Bros. & Co, Pittsburgh, Pa.:

	Black powder, per cent.	Blue powder, per cent.	Lump. per cent.
Silica	1.550	2.480	1.510
Iron	65.350	64 558	65.794
Phosphorus	0.007	0 004	0.028

The samples were dried at 212° Fahrenheit

Analysis of iron ore from the Ormond mine of the Bessemer City Mining & Manufacturing Co., by Dr Otto Wuth, chemist, Pittsburgh, Pa:

Metallic iron, per cent.	Phosphorus, per cent.	Metallic iron, Per cent.	Phosphorus, per cent.
65.67	.033	62.36	.028
68.03	.036	65.54	.003
67.04	.013	67.06	.009
66.91	.013	68.05	.024
67.97	.023	67.10	.008
61.50	.011	67 84	.014
61.53	.009	68.05	.024

These ores contain no sulphur, copper nor titania. The analysis given is made mostly from actual shipments of ore made to parties in Pittsburgh, and were not selected samples, but actual run of the ores. This analysis of 14 carloads, or about 300 tons, shows the true character of one of our mines.

Analysis of iron ore from the Ormond mine of the Bessemer City Mining & Manufacturing Co., by Dr. Otto Wuth, chemist, Pittsburgh, Pa.:

Ore A.	Per cent.
Silicia acid	.97
Alumina	2.57
Peroxide of iron	95.60
Lime	.53
Magnesia	.21
Phosphoric acid	.031
Metallic iron	66 91
Phosphorus	.031

Traces of sulphur, no copper, titania or arsenic.

Ore B.	
Metallic iron	52.10
Ore C.	
Metallic iron	64.53

Analysis of iron ore from the Ferguson mine of the Bessemer City Mining & Manfacturing Co., by Lehman & Mager, chemists, Baltimore, Md.:

	Per cent.
Metallic iron	67.18
Silica	4.67
Sulphur	0 11
Phosphorus	0.05

Analysis of iron ore from the Little Mountain mine of the Bessemer City Mining & Manufacturing Co, by Lehman & Mager, chemists, Baltimore, Md.

	Per cent.
Metallic iron	54.32
Silica	6.67
Metallic manganese	0.45
Phosphorus	0.07

Improved Machinery.

Any person visiting a building where machinery is being erected, cannot avoid being struck by the new and extensive improvement which has been made in all lines of steam and manufacturing machinery, but the same observation will apply with similar force to electrical machinery and appliances. The plants which were instituted so late as four or five years ago and were at that time fitted with all the latest improvements will, at the present day, possess an appearance of antiquity, if later improvements have not been added meantime. This has been brought about partly through a better knowledge and clearer understanding of the downright waste which has been occuring daily in older plants. Increased safety, greater convenience, higher economy, provision againt cessation of operation by probable accidents or interruptions have all been provided for to a greater extent and each requirement has contributed numerous improved devices and of more ornamental design than has heretofore been the practice, or in reality, been called for or required. Among the large steam and electrical plants throughout the country, there are few, if any, but what are provided with duplicate machinery to an extent sufficient to enable them to keep in active operation regardless of ordinary accidents. The effort seems to be to avoid possible as well as probable causes of interruption and where a plant is established in accordance with strict business principles, these points are generally fully covered.—[Stationary Engineer.

LAKE SUPERIOR MINING NOTES.

Supt. Davidson is rushing along lake shipments from the Badger at a lively rate, and some all-rail shipments are also being made to the Illinois Steel Co. Stripping operations at this mine have been finished for the season, but will probably be resumed in the Spring. The surface has been removed from the hanging-wall in order to permit the blasting of the wall early this Winter, preparatory to sinking the three shafts to a second level. The ground stripped has a length of 500 feet, and is about 200 feet wide. F shaft has already been sunk 50 feet below the first, or 100-foot level, and E shaft, the one furthest to the west, will be deepened immediately after the close of navigation, followed soon after by the sinking of G shaft. The Badger has enjoyed an exceedingly prosperous season, having made money for the company, despite the great expense incident to its opening. The mine, it will be remembered, is not a year old yet.—[Florence Mining News.

A. E. Guensburg and the other gentlemen who hold the option on the south half of the northwest quarter of section 24, 40-17, this county, are making arrangements to put in a fine plant of machinery, with a view of opening up and developing a mine which all conservative mining men who have examined the property believe exists there. A large amount of testing has already been done on various portions of the 80 under option by the present company, the results of which have been extremely gratifying. Mr. Guensburg has erected capacious camps, and a permanent working shaft will be commenced as soon as the machinery is in running order.—[Florence Mining News.

The Schlesinger mines will have shipped 700,000 tons of ore by the end of the season. The principal Schlesinger mines are the Dunn, at Crystal Falls; and the Buffalo, South Buffalo, Queen and Prince of Wales, at Negaunee.—[Florence Mining News.

Mining operations at the Fitch have been suspended, and doubt is expressed as to whether the mine will again be wrought, the deposit having so narrowed down as to render its profitable working a matter of doubt, except under favorable circumstances not looked for in the future.—[Negaunee Iron Herald.

The Gibson find, at Amasa, is showing up a great body of ore. The east cross-cut penetrated 34 feet of ore, and was stopped at that, not because of a lack of ore or that the other wall was in sight. At this point a drift was started to the south, and will be run in 50 feet, where the vein will be again crosscut; the new drift is in 10 feet and shows a soft, rich-appearing ore. The width of the vein is not known, but will be determined in the crosscut at the end of the drift now going, but it is a settled fact that the width is beyond 34 feet, and of such ore as the Gibson appears to be that would seem sufficient to insure a brilliant future for the mine.—[Diamond Drill.

A. E. Humphrey, an Ohio man, has secured an option on the east half of the northeast quarter of 2, 58-16, and explorations have been commenced thereon. The land lies about a mile east of the Biwabik, and a showing of ore would not be surprising.—[Iron Journal, Tower, Minn.

Never in the history of the Mesaba range has stock of an iron property advanced so rapidly as that of the Biwabik. In the middle of October it could easily be, and was purchased for $10 a share. Last Saturday a Vermilion mining man offered $40 and could not touch it.—[Iron Journal, Tower, Minn.

All regular ore trains between this city and Ely were discontinued on the 5th, and for the balance of the season what ore is shipped from the Chandler will be brought down by the regular freight. The output of the Chandler in the past three months, 145,000 tons, is the largest in the mine's history for that length of time. In spite of the unfavorable year, the Chandler has already made a commendable increase over last year's output, which was 332,930 tons. Up to date, this year's shipments reach 351,388 and before navigation closes will probably swell to 375,000.—[Iron Journal, Tower, Minn.

Unless all indications are at fault, George Wagner will soon develop a shipping mine on section 16, south of this city. He has an excellent quality of hematite and from present appearances a large deposit of it. This exploration is of special interest to the people of this city, not only as promising an additional industry, but in the development of a distinct range upon which the opening of a number of new mines may follow in due time.—[Negaunee Iron Herald.

A sample of ore taken from the new find at the Platt on the Cascade range the other day, gave .65 per cent. in metallic iron with a bare trace of phosphorus. In other respects the prospect of the mine is good.—[Negaunee Iron Herald.

The Escanaba Iron Co. organization in which Negaunee and Ishpeming parties are principally interested, is making satisfactory headway at the old Swanzey property, located about four miles distant from a station of the Chicago & Northwestern railroad bearing the same name as the mine. Mr. J. B. Mass, president of the company, gives considerable attention to the working of the deposit and has more time to devote to it than formerly, owing to the partial shut down of the Humboldt property, of which he is the local head. The mine at Swanzey has been shipping for the past three months, and those who have used the ore are well pleased with its action in the furnace.—[Iron Ore, Ishpeming.

The shaft being sunk beside the Winthrop Iron Co.'s boundary line found ledge, a mixed ore, in the west side of the shaft, the distance from surface being 40 feet. It had been thought that a greater depth would have to be sunk before passing through the surface.—[Iron Ore, Ishpeming.

The latest on the list to show up ore beneath the dyke is the Anvil mine. Superintendent Bennett set about the test some time ago, starting the drill at a point about 600 feet north of the foot wall and penetrating the ground at such an angle as to cross-cut the formation. At a vertical depth of 530 feet a body of clean ore was struck which was penetrated to a distance of 50 feet, when the foot wall was reached. The result of this test goes to prove the continuance of the ore body below the dyke at the mine which was specially mentioned by commissioner Lawton in his last annual report as instancing the fact that the dyke formed the bottom of the ore deposit. The next report will have occasion to represent the facts in quite a different light. A sale of 20,000 tons of Anvil ore has just been made to the Illinois Steel Co., the shipments to be made by rail and to begin in the early part of January.—[Bessemer Pick and Axe.

The Kirk Co. is diamond drilling for ore on lands located upon the range lying between the American and Dexter mines, and about half a mile from the American. They have a hole in the ledge a distance of 70 feet, it being inclined north at an angle of 60 degrees. It has cut quartzite and soapstone, and is now in a hematite formation that is encouraging. To the north some distance is the jasper. There is a heavy drift here, 52 feet, about half of which covering is made up of huge boulders that are difficult to sink a standpipe through.—[Iron Ore, Ishpeming.

The rapid falling off in the ore shipments from Ashland, indicates the approach of the end of the season. Only about 20,000 tons sent forward this week —[Bessemer Pick and Axe, Nov. 7.

NEW SMOKE PREVENTION APPLIANCE.

A smoke prevention apparatus, which has been used with great success in some of the largest manufactories in Manchester and other Lancashire towns, has been applied to marine boilers, with highly satisfactory results. The appliance is the invention of a Manchester gentlemen, Mr. W. M Greaves, and since its introduction the smoke nuisance, so prominent an aspect of that district, has been considerably diminished. Like many other valuable appliances, the invention is remarkable for its simplicity. It is based upon the universal experience of engineers that the temperature of a furnace is never sufficiently high to ensure complete combustion. Every inch the temperature travels it is lowered, owing to the absorption of heat by the metal and the water in the boiler. This is the natural consequence of the contact of heat with these two materials, both being highly conductive. The inventor holds that if the temperature is to be raised so as to consume the smoke it must be done by the construction of a kind of store-house, which shall withhold the heat for a limited period from contact with the boiler. As smoke is the result of imperfect combustion, it is clear that when perfect combustion occurs there will be no smoke, which is simply uncombined or unburnt carbon. As such it represents a direct loss to the producer, because if the carbon had been united with its equivalent of oxygen it would have produced its equivalent of heat. The appliance which has been invented to induce this combustion consists of a series of three concentric arches. These arches, or saddles, which in appearance resemble fireclay, are placed one over the other upon the ordinary bridge of the boiler, or upon a special bridge built for the purpose. They are constructed of a highly refractory material, chemically prepared by the inventor, which rapidly becomes highly heated by the temperature of the furnace, and as the gases of combustion pass through them they are consumed, and the formation of smoke prevented. In short, the incandescet glow of the arches inflames any gases that may be escaping from the furnace, and cause complete combustion. The experiments made recently at Liverpool on marine boilers were most successful. Except when the doors were opened for firing up or trimming the furnaces—when an excess of air was admitted—no smoke was allowed to form. A test made with two boilers, one fitted with the appliance and the other without, showed that while the one emitted dense black smoke, that fitted with the appliance sent up only a few pale wreaths. The gentlemen expressed themselves satisfied with the invention.—[Glasgow Engineer.

INFLUENCE OF ZINC ON STEEL.

In connection with the bursting of a gun on board an English vessel, attention is being directed to the characteristics of certain qualities of steel. A correspondent of *Ironmonger* holds, that steel is liable to be changed by the action of time, unaided by any external, mechanical, or chemical influences. In support of his view that time alone appears to be sufficient to produce these changes, he cites several examples of failures which have occured within his own experience. At one of the engineering establishments in London a number of flat steel plates cracked spontaneously, with loud reports, several months after they had been received, and without any work having been subsequently done to them. Some solid steel armor plates, supplied to a Continental navy, are said to have failed in the same way, and others from the same batch cracked on being tested by dropping. Numerous boiler plates have cracked after the boilers had been at work for years, and weeks after the steam pressure had been reduced and the water run out, and this, too, in spite of the fact that every boiler is tested to double its working pressure when new. Another instance is the cracking of hardened armor piercing steel shells several months after they have been delivered to the authorities. This is attributed to the after effects of the hardening process, but if these were independent of time, the shells ought to crack at all.

At the May meeting of the British Iron and Steel Institute, Dr. Anderson, of Woolwich, in a paper on the "Tests for steel used in the manufacture of artillery," dealt with the question in a very interesting manner, and the paper showed that the peculiarities mentioned are caused chiefly by the unequal tension of the metal, whether caused by the process of oil-hardening or in some other manner. The metal may remain for a long time in this strained, condition, and then a slight change in temperature, or some other relatively slight cause, brings about a rupture. To obviate the risks thus incurred is a task not beyond the skill of metallurgists; but even after science has had its full play and chemistry its fullest functions, it may be that the influence of time will deserve consideration. It is well known, for instance, that some cutlery firms prefer to keep their cast steel ingots two or three years before working them up, because experience has demonstrated that the steel is improved thereby.

IMPROVED SWINGING CUT-OFF SAW.

The new swinging cut-off saw illustrated herewith, embraces new features and points of superiority that are already being thoroughly appreciated by the trade, and the saw is fast becoming the most popular swing saw in the market. The frame is cast iron, cored out, and is very wide at top bearing which makes it impossible to get out of line. The hangers are of an improved pattern, and are connected. The counterbalance weight is adjustable, and is a great labor saving device, aiding the operator, as it does, both ways, and when the cut is made, swings the saw back clear of the lumber and without

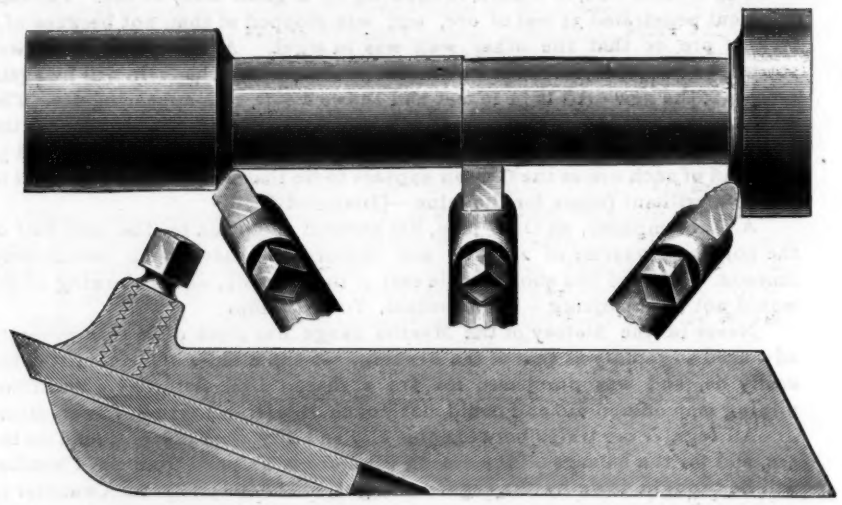
any effort on the part of the operator. The counterbalance, together with the improved saw shield, are an absolute safeguard against accidents to the operator. The vertical adjustable arbor is an entirely new feature in this class of saws. The stem of yoke is turned true, and has a planed key-way into which a feather is fitted, hence the saw is always square with the table. The extreme adjustment is five inches, making it possible to change saws from a large coarse blade to a small fine one, or vice versa, to suit the work in hand, and also to wear saws smaller than on the ordinary machine. The double tightner is provided to take care of slack in belt. In construction the machine is unexcelled, the material and workmanship are of the very best. Every machine is tested before shipment. Tight and loose pulleys are 10x5 inches, and should make 600 revolutions per minute. The machine carries a 16-inch saw. Weight 750 pounds. For further particulars, address the Indiana Machine Works, Fort Wayne, Ind.

The Hastings Steel.

There is at present in Toronto a gentleman of an inventive turn of mind, who has made a discovery that will be of incalculable benefit to the industrial world. He is Mr. J B. Hastings, of Parkersburg, West Virginia, and his invention is a new process of converting pig and scrap iron into steel that is adapted for use in almost all kinds of manufactures into which cast steel enters. It will entirely revolutionize the present method of steel production, and immeasurably diminish the cost thereof. Although Mr. Hastings has attained a degree of success in his new process far beyond what might reasonably have been expected, his invention, like almost every new idea, is susceptible of still greater development, and there is no doubt that the day will come when all other methods of steel production will be suspended by this the latest, the most simple and, what is of still greater moment, the most economical. Some people have conceived the idea that Mr. Hastings professes to make all kinds of steel, including that used for structural and other kindred purposes. This is not the case, as Mr. Hastings only undertakes to produce cast steel. He has most completely succeeded in accomplishing what he set out to do, that is, by a chemical process, to convert iron in its crude or raw state into cast steel. The process is this: Mr. Hastings places a chemical compound in the form of a powder in a ladle, into which is drawn off the molten iron from the cupola. The metal becomes permeated with the chemical and the action produced thereby is completed within the amazingly short space of two minutes. The metal is then poured into the mould, and the casting thus made after being taken from the sand is as soft and workable as cast iron, except that it is much closer and has to a large degree the quality of toughness. The casting is then tooled to any shape required in its utility, after which it may be tempered to any degree of hardness desired. After the iron has been changed in the granulation it can be tooled and tempered just as often as you please. Mr. Hastings says that in Canada there are all the ores to be found in the United States, and he sees no reason why cast steels could not be successfully made by his process in this country just as they are produced by the Bessemer and other methods.—[Toronto Empire.

THE ARMSTRONG LATHE TOOL.

The accompanying engraving represents a tool designed for general use on lathe, shaper or planer, and is manufactured by Armstrong Brothers, 78 Edgewood avenue, Chicago. This tool, notwithstanding its extreme simplicity, has many valuable features never before combined in a tool holder of this kind. The following are its chief points of merit: In this tool, all forging is dispensed with and grinding is reduced to a minimum. The points can be ground to any desired shape or clearance. It is of a handy length, and the point always keeps at the same height. It will work either right or left hand, and



as there are no side projections, it can be used close into a corner. The rake of the cutter is such that it takes a clean, curling chip from wrought iron, or steel, no top grinding being necessary. There is absolutely no slip to the cutter, it is supported directly under the strain of the cut, and will do as heavy work as any forged tool of same size. The cutters are simply straight pieces of square steel, stock size; and as one pound of tool steel in this tool equals ten pounds in the ordinary tool the finest quality of tool steel or "self-hardened" steel can easily be afforded. The cut shows sectional view and application of tool. When used in shaper or planer the clearance should be reduced to suit. The holder is drop forged of steel, the set screw is tool steel tempered, and the cutters are made of fine "special" steel, uniformly tempered. Further information, circulars, etc., may be had on addressing the makers.

A Contrast of Industrial Growth between Great Britain and Germany.

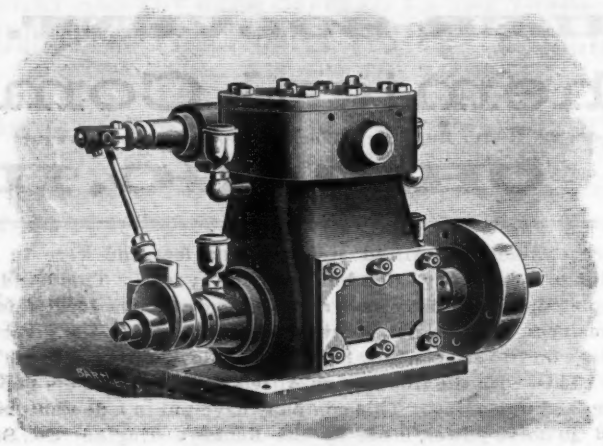
The respective increase in the production of raw materials in Great Britain and Germany is very striking. The figures cited in the report extend back to the year 1850, and are given at the end of each decade up to 1890. At the half century, for instance, Great Britain produced 2,250 000 tons of raw iron and Germany only 208,000 tons. In 1890 the respective production of the two countries increased to 8,000,000 and 4 637,000 tons, respectively. Thus, within 40 years the production in Germany, from being scarcely one-tenth of that of Great Britain, has become over one-half, the percentages of the increased output being 255 in Great Britain against 2,129 in Germany. In the manufacture of steel the comparison is no less instructive, the produce of the two countries in 1872 being 417,000 and 189,000 respectively; while in 1890 the figures stood at 3.636 000 and 2,161,000 tons, the percentage of increase in 19 years being only 772 in Great Britain, against 1,043 in Germany.—[The Mechanical World, London.

A Saving of Fuel.

A Western engineer has patented a device by the use of which the steam that is often allowed to go to waste when a locomotive is standing at a way station taking wood or water, can be utilized for pumping water for the tanks or reservoirs around this station. It is customary at most large stations to have a stationary engine and steam pump for raising the water, but the inventor claims that by his arrangment this cost for fuel is saved, while the expenses of adding the improvement will be less than the cost of the pumping arrangments now in use.

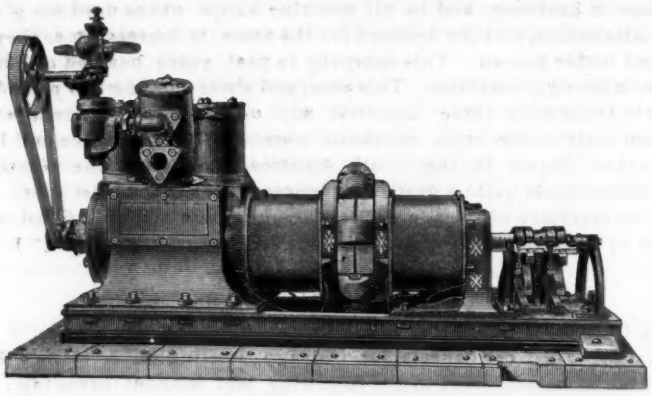
THE EVOLUTION OF THE DIRECT-CONNECTED DYNAMO.

It is an interesting fact that the Westinghouse Machine Co. was the builder of the first direct-connected dynamos in the United States, if not in the world. In fact, the idea of a direct-connected dynamo is responsible for the Westinghouse single-acting engine. In 1880 the Brush Electric Co. con-



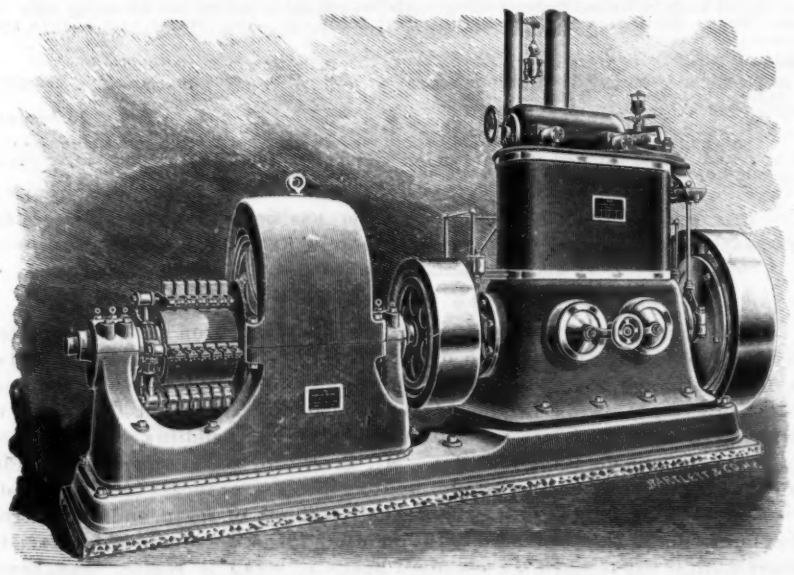
FIRST WESTINGHOUSE STEAM ENGINE, A. D. 1880.

ceived the application of the electric arc for locomotive head-lights. Belt transmission being out of the question, the problem of a direct engine was laid before Mr. H. H. Westinghouse, of Pittsburgh, for solution. The terms of the problem were stated about as follows: The speed must not be less than 1,000 revolutions, and the power developed not less than 1½ net horse-power. The engine must be able to stand up under 150 to 180 pounds of steam; it must be self contained, so as to be bolted to the locomotive, like a brake pump; it must be sufficiently rigid, so as to stand all the shock and jar of service; it must be inclosed completely, as a protection from dust and cinders; and finally, it must be capable not only of several hours' continuous running without attention and of continuous service day after day, but must be of such a design as to run for an indefinite time without any attention whatsoever, while the locomotive is side-tracked and the engineer absent. It is evident that the



FIRST DIRECT-CONNECTED DYNAMO, STILL IN USE AT THE UNITED STATES GOVERNMENT TORPEDO STATION, NEWPORT, R. I.

one solution possible was the single-acting, self-contained and self-lubricating engine. It is interesting to note that with no original thought beyond some special application of this kind, the above type of engine has propagated itself without essential modification, until it has developed a business of the present enormous proportions, involving compound and triple-expansion engines up



THE PRESENT WESTINGHOUSE ELECTRICAL GENERATOR.

to 1,000 horse-power. The original engine, whose history we have recited, now fills with dignity the position of center-piece in the office of the Westinghouse Machine Co., at Pittsburgh.

A more serious attempt following the comparative success of the locomotive experiment was the constructing of several short-stroke engines developing about 10 horse-power for coupling direct to Brush machines at 800 to 1,000 revolutions. A number of these were built and operated successfully—one at least after ten years of service is still regarded as the most reliable engine in the experimental plant of the United States Government Torpedo Station, at Newport, R. I.

The single-acting engine has fairly proved its right of inheritance to this special trade. The primary idea of forcing an engine to an abnormal speed to meet the supposed demand of the dynamo was unnatural and wrong. The commercial conditions of electrical construction at that time prohibited any compromise, but the present state of electric art has changed all this, and the reasonable idea now prevails of cutting down the speed of the dynamo instead, to the normal speed of the engine. This is commercially possible within fair limits, and the single-acting engine with its natural capacity for high speed forms a complete solution of the problem.

ONTARIO'S IRON MINES.

It is a matter of serious consideration and regret that the extensive iron mines of Ontario are idle. The only one which shipped any ore last year has suspended work. In his recent report to the legislature of the province on the development of the iron industry of Ontario, the Inspector of Mines write: "From the Williams mines, situated three miles from the Madawaska station on the Kingston & Pembrooke railroad, and two miles from a siding, has been shipped a quantity of ore. In the eleven months previous to last June 12,000 tons of good magnetic Bessemer ore had been taken out. The average of 65 tons per day was then being raised and carefully sorted and washed. About 7,000 tons of ore were ready for shipment, averaging a grade of 65 per cent. A vein of ore 15 ft. wide had been opened for a considerable distance on the surface, and the principal workings had reached a depth of 100 ft. on an incline of 30 deg. west. A large number of mines of iron have been worked extensively in former years which are now shut down, as the duty of 75 cents per ton on all iron ore shipped into the United States prevents their being successfully operated for shipping purposes. Were this prohibitory tariff removed it is likely that work would be quickley resumed at these rich mines and assume immense proportions. Besides those already opened, extensive new iron ore beds would be operated throughout the counties of Hastings, Addington, Frontenac, Renfrew, Leeds, Granville, Lanark and Carleton. The districts of Muskoka, Parry Sound and Nipissing would also find an outlet for their high grade ore now locked up in these extensive ranges." Sir Richard Cartwright and others who have made the iron question a study urge the Government to engage the services of competent engineers from Sweeden to study the mines of the province. "In northwestern Ontario," says the inspector, "the recent prospecting in the district of Thunder Bay and Rainey River has determined that wide ranges of high grade ore bound."

Mr. Richard R. Paulison, of Port Arthur, Ont., who is well acquainted with the mines of western Ontario, writes as follows respecting the Mesabi range, the extention of the celebrated Vermilion and the Attikokan ranges: "To the northward from Port Arthur is the Gunflint, Arrow and Whitefish lakes range, a continuation of the Mesabi range, and so far has been traced to Minnesota from a point about six miles southwest of the north of Gunflint Lake, and passes northeasterly, north of Gunflint, Arrow and Whitefish lakes and north of the Canadian Pacific road. The geological formation on this range is highly favorable for the opening up of enormous iron deposits of good merchantable quality. On this range, six miles across the boundary in Minnesota, the Milwaukee Iron Co. opened up its property by trenching and with a diamond drill, and as their formation is precisely similar to that north of the lakes mentioned above, the result they obtained may be interesting, and is about as follows: On the surface they had to go by the geological formation almost entirely, and after throwing aside about 6 ft of alluvium and rock they uncovered 6 ft. of high grade Bessemer ore. Passing through this they struck 8 ft. of mixed up rock, jasper and iron, and then went through 15 ft. of solid high grade ore, carrying five per cent, of manganese. The same indications have been found at the west end of Gunflint Lake, northeasterly to Kaministiqua station. To the northward also is the continuance of the famous Vermilion range, which has not been explored beyond Hunter's Island, but the deposits are supposed to continue through Shebandown Lake, northeasterly. The most northerly range so far located is known as the Seine and Attikokan range, and numerous discoveries are being made at this point. The deposits on this range are very apparent on the surface, and the ores are of a high merchantable quality. The deposits on these three upper ranges contain hematite and Bessemer ores.—[Railroad Gazette.

A New Use for Old Steel Rails.

In the window of Messrs. Brackenridge & Co., King street, are models of Barnes' patent steel rail pit props and framework for collieries, mines, shafts, tunnels, aqueducts, bridges, jetties, gantries, culverts, sewers, flues, cattle-creeps, cellaring, supports, etc. The objects of the invention are to utilize old or defective rails, both of which are equally serviceable with new rails, and to provide props and other supports of great strength and security, which, from their material, are practically imperishable, and will also be eventually cheaper than any form of mining supports. Mr. Barnes has made use of iron and steel rails, which are cut into suitable lengths, and by slots or notches at the ends are shaped so that they can be easily framed together. We are informed that the Whitehaven Colliery Co. is testing several main road sets, and that they have stood unaltered in position under the greatest possible pressure and strain, and the sole strut sets have effectually prevented the heaving or rising of the floors. The company speaks highly of the systems, and intends extensively adopting them at all its pits—[Ryland's Iron Trade Circular, Birmingham.

STEAM USERS Should Read this.
Increase the Capacity of your Boilers.
Scale is a Non-conductor of Heat.

SAVE YOUR FUEL AND PROTECT YOUR BOILERS FROM SCALE AND GALVANIC ACTION OF WATERS. WATERS ANALYZED **FREE** AND THE COMPOUNDS MADE TO SUIT EACH WATER.

INTERNATIONAL BOILER SOLVENT.
(PURELY VEGETABLE.)

Dearborn Drug & Chemical Com'y,

Manufacturing and Analytical Chemists, W. H. EDGAR, Manager. Office, Room 29, Rialto Building; Works, 4246 Champlain Avenue;
Ohio Office, Canton, O. ROBERT H. CREVOISE, Agent.
WRITE FOR INFORMATION AND PRICES. BEWARE OF INFRINGEMENTS.
CHICAGO, ILL.

FACTS ABOUT STEAMSHIPS.

What was the name of the first steamship that crossed the Atlantic? and how long did it take her? The Savannah in 1819; 25 days.

What is the cost of a steamship like the Majestic? Nearly $2,000,000.

What steamship carries the largest number of cabin passengers? The Etruria, 550.

What has been the greatest day's run of any ocean steamship? 517 miles.

How many steamships are there engaged in the transatlantic passenger trade? About 90.

What is the longest steamship now in service in the world? The Teutonic, 565 08 feet long.

What captain has been the longest in the transatlantic service? Captain Brooks, of the Arizonia, Guion Line.

How many cabin passengers were landed in New York during 1890? 99,-189.

How much coal is consumed by one of the great liners in 24 hours? About 280 to 335 tons.

What is the average expense of a single voyage—New York to Liverpool and return? $75,000.

What were the dimensions of the Great Eastern? when was she launched? and what was her horse-power? 680 feet long, 83 feet broad, 25 feet draft; launched on January 10, 1856; horse-power, 6,600; she had both sidewheels and screw.

What is the length of a nautical knot in land measure? 6,080 feet; a land mile is 5,280 feet.

What is the distance sailed, in nautical miles, from New York to Liverpool? New York to Sandy Hook, 16 miles; Sandy Hook to Roche's Point, northern, track, 2,805 miles; southern track, 2,880 miles; from Roche's Point to Mersey Bay, 229 miles; and from the bar to the stage landing in Liverpool, 14 miles. Totals: North track, 3,064 miles; south track, 3,139 miles.

Between what points are records estimated? Sandy Hook and Daunt's Rock, Queenstown Harbor, near Roche's Point.

What is the first light sighted on the British coast? the American? Bull, Cow and Calf, south of Ireland; Nantucket or Fire Island.

What is the greatest number of immigrants ever landed in New York in a year? in a day? 445,550 in 1883. Nearly 10,000, May 11, 1887.—[Scribner's.

SOLID CINCINNATI CONCERNS.

THE LIBERTY MACHINE COMPANY.

The Liberty Machine Co. have removed from No. 240 Liberty street, to the northwest corner of Cutter and David streets, Cincinnati, O. In their new location in a three-story building with more frontage and depth and light, they are in much better shape to carry on their business in every way. Messrs. Klein & Cohn, who are the proprietors of this company, are one of the old firms, who have been for many years engaged as extensive dealers in and shippers of all kinds of scrap iron and steel, and are known in a large section of the country as one of the largest and most reliable firms in that line of business. Their place of business is 479 to 483 Plum street, Cincinnati. This firm being possessed of abundant means, are enabled to carry on the manufacturing part of their business in every way with the greatest degree of success they could wish for. The Liberty Machine Co. are extensive dealers in new and second-hand machinery, and have a good supply of men and machinery to put all of the machinery they have and may have for sale in the most complete and perfect working order in every particular. Mr. W. C. Carroll, the general manager of the Liberty Machine Co., though still a young man, has had many years' experience, and as a machinist is a very thorough and practical mechanic, and is well fitted for the responsible position he holds. Hanchett Bros. & Co., are erecting buildings in Miles Grove, Pa., for a foundry and machine shop. In looking around for such machinery as they would need, they made contract with the Liberty Machine Co. for a complete outfit of machinery. This contract will foot up to quite a large amount, and it is quite gratifying to this company, in securing so large an order, in competition with so many others in same line of business. Hanchett Bros. & Co.'s business will be carried on under the name of the Ideal Foundry Co., and they intend to start up January 1st, 1892. The Liberty Machine Co. in their new location, will be pleased to see any needing anything in their line, new or second hand, and Mr. Carroll will take pleasure in showing their stock on hand and giving any desired information, and all letters or inquiries, will receive every care and attention.

THE CINCINNATI MILLING MACHINE COMPANY.

Sometime ago the attention of the readers of this paper was called to the fact that the Cincinnati Milling Machine Co., finding that they were needing more room than the place they occupied, had purchased a lot on the corner of Spring Grove avenue and Alfred street, 120x133 feet, and were to commence the erection of a two-story brick building 50x133 feet. This building having been completed, the company have removed and are now located in their new place of business. In this new location, not only having the great advantage of a frontage on two streets, they have a wide alleyway on the south side of the building. This, with the frontage on Alfred street, gives them good facilities for loading and unloading. This company have put in a new automatic cut-off engine of 40 horse-power, made by the Buckeye Engine Co., Salem, O.; a Sturtevant hot-blast heating apparatus; a new large Gray planer, made by the G. A. Gray Co., corner of Sycamore and Webster streets, Cincinnati; a freight elevator from the Warner Elevator Manufacturing Co., corner of Eighth and Harriet streets, Cincinnati, and a traveling crane to carry articles from the rear to the front end of building on the ground floor. A new tubular boiler was put in the engine room, made by Robert Jones & Co., No. 133 East Pearl street, Cincinnati. This company at present are working the same number of men they had in their location on Second street, but in the coming year it is their intention to increase their working force. The milling machine made by this company has many merits, making it in its arrangements superior to many made, and better suited for all purposes for which such machines are used. Not content with all the good points it now has, it is the intention of this company to make still greater improvements in the same as fast as can be done, that they may have one of the most, if not the most, perfect machines made. Large numbers of these machines have been sold since this company have been in business, and in all machine shops where used are giving universal satisfaction, and the demand for the same is increasing as they become more and better known. This company in past years has had a share in the trade with foreign countries. This year, and since the new law providing reciprocity in trade with these countries and opening up our manufactories to them, not only in the more northern countries, but in France and Italy, and in a marked degree in the South American countries, the company finds in its foreign trade quite a gratifying increase over that of last year. Mr. F. A. Geier, the secretary of the company, is a young man and well fitted to fill that position to his own credit and that of his company. J. P. G.

High Grade Alabama Iron.

The United States Rolling Stock Co., of Anniston, Ala., recently received an order for 3,000 car wheels for Chicago, Burlington & Quincy Railroad, which were to be subjected to the following test without breaking: A 1,640-pound weight dropped from a height of 15 feet three times in succession; 1,640-pound weight dropped from a height of 20 feet two times in succession. In reporting the test the *Hot Blast* says: "The axles stood three blows in excess of the required number without sustaining a single fracture." The following is the official report of the test:

UNITED STATES ROLLING STOCK CO, ANNISTON, ALA.—MILL AND FORGE DEPARTMENT.

Axles made by United States Rolling Stock Co., and subjected to the following tests for the Chicago, Burlington & Quincy Railroad, October 19, 1891; drop weight, 1,640 pounds, supports 3' 0" centers:

Deflection 1st blow, 15 feet.	Deflection 2d blow, 15 feet.	Deflection 3d blow, 15 feet.	Deflection 4th blow, 20 feet.	Deflection 5th blow, 20 feet.	Deflection 6th blow, 20 feet.	Deflection 7th blow, 20 feet.	Deflection 8th blow, 20 feet.	Remarks
2⅛"	¾"	2¼"	⅞"	2"	⅝"	2⅛"	⅝"	No fracture.

These axles were required to be subjected to the following test without breaking, viz.: A 1,640 pound weight dropped from a height of 15 feet three times in succession; a 1,640-pound weight dropped from a height of 20 feet twice in succession.

B. F. PEACOCK, Supt. Mill and Forge.

It is reported that the result of this test has been to bring an order for 4,000 axles from another road.—[Manufacturers' Record.

Improvement in the Manufacture of Puddled Iron.

Some improvement in the manufacture of puddled iron has been patented by Mr. J. A. Crawford, of Church street, Walker-on-Tyne. It is not often now-a-days that much attention is paid to introducing anything new in the puddling process, as owing to the advances made by steel, and the extent to which iron has been driven out of the market by it, puddling iron has been looked upon as a decaying industry. Mr. Crawford, in manufacturing malleable and gun iron by the hand puddling process, proposes to melt the pig iron to be used in a cupola with a small amount of scrap, and on the iron becoming liquid it is conveyed to the puddling furnace, and allowed to remain there until it has reached the standard heat. If scrap is scarce, manganese may be added to the liquid iron after leaving the cupola. It is claimed that the output per puddling furnace is much increased.—[Glasgow Engineer.

WE understand that certain Midland and Welsh steel makers are giving serious attention to the invention propounded by Sir Henry Bessemer, at the Iron and Steel Institute, of rolling steel sheets direct from fluid metal. A practical application of this invention is anticipated.—[Glasgow Engineer.

THE HACKNEY HAMMER CO.
OF CLEVELAND, OHIO,
MANUFACTURE THE MOST SUCCESSFUL
POWER HAMMER
THAT HAS YET BEEN OFFERED TO THE TRADE,
THOROUGHLY PRACTICALLY TESTED FOR TWO YEARS
BEFORE BEING PUT ON THE MARKET.
NOW ENDORSED BY SOME OF
THE BEST FIRMS IN THE COUNTRY.
WRITE FOR CATALOGUE AND ALL INFORMATION.

INDUSTRIAL SUMMARY.

New Enterprises:—

The Knoxville Furnace & Mining Co. have been incorporated at Knoxville, Tenn.

John F. Pollock, James M Loring and Charles A Loring have incorporated the Acme Motor Machine Co., of East St. Louis. The capital stock is $500 000.

The Paragon Manufacturing Co. has been incorporated at New Haven, with a capital stock of $16,000. The company will manufacture hardware, tools and specialties.

The Thomas Car Coupler Co. has been incorporated at Sulphur Springs, Tex., by J D. Lundy, of Chicago, Rice Harris, of St. Louis, J. B. Thomas and others. The capital stock is $100,000.

The Damon Safe & Iron Co., of Boston, are announced as having decided to locate at Waukegan, Ill., where they will complete and occupy the plant started by the late Chicago Safe & Lock Co.

The Hall Kirsch Steel Co. of Anderson, Ind., has filed articles of incorporation, with a capital stock of $165 000. It is intended to establish a plant for the manufacture of steel billets and steel castings at Irondale, near Anderson.

The Connell & Dengler Machine Co., of Rochester, N. Y., has been incorporated to make machines and machine supplies, and to operate a foundry; capital, $1 000; directors, John Connell, Valentine Dengle, Jacob S. Irwin and others.

The McDowell Steel Co., of Chicago, has been incorporated by Frederick Arnd, C. M. Walker and Arthur F Evans, with capital stock of $90,000. The same parties have also incorporated the South Chicago Steel Casting Co. with capital stock of $20 000.

John Q. A Houghton, of Baltimore, Md., and others have incorporated the Houghton Machine Manufacturing Co. to manufacture, at Harper's Ferry, W. Va., the patent button-hole machine of John Q. A. Houghton. The capital stock is $10 000, with privilege of increasing to $500,000.

O C. Barber, of Illinois, Charles Baird, of Warren O., and John Hill and G. G. Jordan, of Columbus, Ga., have incorporated the Neracher & Hill Sprinkler Co. to manufacture, at Columbus, automatic sprinklers and all other fire protective apparatus and appliances. The capital stock is $50,000, with privilege of increasing to a sum not exceeding $2,000,000.

The Anderson Rolling Mill Co., Anderson, Ind., has lately begun operations under very favorable circumstances. It is located at the junction of the Cincinnati, Wabash & Michigan and the Belt Line railroads and is supplied with natural gas from its own well. Its specialties will be cotton-ties and merchant iron. We understand it has orders ahead to the amount of 800 tons. The affairs of the company are in excellent hands, the Secretary and Treasurer being Mr. V O Foulk, late of Cleveland, and the Superintendent, Mr. Wm. Hanna, for more than twenty years with the Britton Iron & Steel Co., of Cleveland.

Additions, Enlargements, Removals, etc.:—

The St. Louis Screw Co. is preparing plans for a new factory. The property was purchased some time ago, and is 150x140 feet.

Creswell's Iron Foundry, at Philadelphia, Pa., is to be removed to a new site, where a two-story brick structure 190x70 feet is being erected.

An addition 150x100 feet, designed for the manufacture of Bessemer steel castings, is being added to the plant of the Sharon Steel Casting Co., at Sharon, Pa.

The Pennsylvania Tube Works will be increased by the addition of a furnace and all necessary machinery for making 36 inch pipe. The largest size now made by the company is 20-inch, and the largest made in the district is 24-inch. The capacity of the plant will be increased by 90 to 100 tons daily.

Fires and Accidents:—

The Tin Stamp Works, of Ball Bros., at Muncie, Ind., were burned October 28; loss, $52,000.

The turnbuckle factory, of the Brazil Steel & Iron Co., of Indianapolis, Ind., was entirely destroyed by fire, on the 30th ult. Loss, $40,000; insurance about one-fourth. Fifty hands are thrown out of employment.

The buildings of the Minneapolis Rolling Mills, at New Brighton, north of Minneapolis, Minn., burned the 29 h ult. The plant, which was only recently built, cost $50,000, but the furnaces and heavy machinery are uninjured. The loss is about $12,000; fully insured. It will be rebuilt at once.

General Industrial Notes:—

The Buckeye Marble & Freestone Co., corner Third street and Eggleston avenue, Cincinnati, O., have the contract for the marble work of the building being erected corner Sixth and Walnut streets, Cincinnati, O., for the Times-Star Publishing Co.

The Walton Architectural Iron Co., Harrison and Calvert streets, Cincinnati, O., have the following contracts: The *Times-Star* building, six stories, corner of Sixth and Walnut streets, Cincinnati, O.; iron girders for a building in St. Louis, Mo.; Government Building, Chattanooga, Tenn.; Masonic Temple, four stories, Ashland, Ky.

Mr. S. W. Calhoon, formerly with Strong, Carlisle & Turney, has been appointed manager of the Cleveland branch of the Brownell & Co., of Dayton, O., with headquarters at 30 South Water street. Mr. Calhoon is prepared to furnish estimates on boilers, engines, saw mills, tanks, heaters, etc.; and as he represents one of the most reliable firms in the business, can be relied upon to turn out the best work.

The Jeffrey Manufacturing Co., of Columbus, O., report business as good in their different lines of specialties. They have many large orders on their books for elevators and conveyors for handling material in bulk or package, and have recently purchased a tract of land adjoining their present extensive works, on which they have erected a large and substantial brick building, that they may be better able to take care of their growing business.

H. J. Reedy & Co., manufacturers of elevators, Eighth and Lock streets, Cincinnati, O., have the following contracts: The Pickening Building, Fifth and Main streets, Cincinnati, O., one hydraulic passenger elevator and one hydraulic freight elevator; Kuby House, Muncie, Ind., one hydraulic passenger elevator; Doxey House, Anderson, Ind., one hydraulic passenger elevator; the Four Seasons Hotel, Hanegate, Tenn., one Climax steam passenger elevator.

At a recent meeting of stockholders of the Eagle Iron & Steel Co. the following nine directors were chosen: H. A. Marting, S. B Steece, Joseph Fisher, C. H. Ketter, A. Winters, F. C. Tomlinson, Geo. B. Davis, W. D. Jones, Lewis Jones. In the evening the Directors held a meeting at Gen. Enochs' office, when the following organization was perfected: President, H A. Marting; Vice-president, S. B. Steece; Secretary and Treasurer, F. C. Tomlinson. The election of a superintendent was deferred. A communication from Lewis Jones was read, to the effect that he subscribed stock, $8 000, in the following manner: $3 000 cash down and $100 a month till the balance of the $5 000 was paid, which subscription was conditional on his election as superintendent for four years, and the sole authority of doing all the buying conferred on him; and that if at any time the company was dissatisfied with his services, it should buy his stock at par. This proposition seemed so vigorous in its terms that the directors laid it over for future action—[Ironton (O.) Register.

CENTRAL THOMSON-HOUSTON COMPANY,
48 ARCADE, CLEVELAND, O.
S. D. NESMITH, - - - - - - Manager.
Motors from 1-12 h. p. to 100 h. p.
ELECTRIC LIGHT PLANTS INSTALLED,
Arc and Incandescent, Direct and Alternating,
ELECTRIC FANS!
FANS FOR VENTILATING!
ELECTRIC SUPPLIES.

Canada Plates.

The demand for Canada plate has this season been unusually large, both in this market and in that of the United States. The manufacture of stove pipe is the industry which gives the main support to trade in Canada plate, but there are other applications of this material which afford a basis for a good deal of business in it. Trunk makers and the manufacturers of certain descriptions of packing cases call for a considerable amount of stock in a year. The stove-pipe trade goes hand-in-hand with the trade in stoves, and there have been preparations made for a big Fall business in stoves. This has given more than wonted activity to the demand for Canada plate. Some of the largest sales ever made on this market have been made this week. A lot of 1,000 boxes was taken by a manufacturer who will turn it all to uses other than stove-pipe making. This shows a developing market for this class of plate.

There has been very general dissatisfaction this Fall with the Blania plate received. Hitherto this has been in strong request here. But the quality of the stock that has come in during the present season is far below the standard of that received in former years. The samples have in the majority of cases determined importers to cancel orders, and among those who accepted shipments there has been an unusual experience of returned stock from dealers. The stock has been very brittle, and almost entirely lacking in bright plates. This is unfortunate for the manufacturers, as it has cost them an exceptionally good season's trade. Other brands have had a strong run, and have maintained the standard of quality which has always been credited to them.—[Hardware, Toronto.

Swiss Method of Hardening Cast Steel.

The following is said to be the Swiss method of hardening cast steel for cutting tools. Mix in a suitable vessel four parts of pulverized resin and two parts of train oil. Stir well in this one part hot tallow. Into this mixture the article to be hardened is plunged at a low red heat and held there until thoroughly cooled. Without cleaning off, the piece is again put into the fire and suitably tempered in the ordinary way. An examination of steel thus hardened indicates that the hardening is deeper and more uniformly distributed than is commonly the case, and that the steel is less brittle. Articles thus hardened have excellent and durable cutting qualities.

Chicago and Return, $6 00.

Patriarchs Militant I. O. O. F., Cleveland Canton No. 33, will run an excur-

sion to Chicago, via the Nickel Plate, Monday, November 16th. Train leaves 6.30 A. M., giving seven days to visit the city of the World's Fair. The American Fat Stock, American Live Stock, American Poultry and American Dairy Show will be held November 11th to 21st. Procure tickets from following members: G. W. H. Young, 903 Woodland avenue; J. A. Robinson, 52 Public Square; H. Cohn, 778 Lorain street; A. T. Van Tassel, 250 Detroit street, R. Mohrman, Minnesota and St. Clair streets; E. Slade, 1954 Euclid avenue; F. Freedle, 34 Scovill avenue; A. J. Spencer, Cataract House, Newburgh; E. A. Cobb, 1205 Cedar avenue; C. H. Cobb, 1377 Cedar avenue, and Nickel Plate agents.

NICKEL PLATE excursion to Chicago, November 16th. Tickets good seven days; $6.00 round trip.

TAKE the I. O. O. F. excursion to Chicago, November 16th. Train leaves 6:30 A. M.

THE STIRLING COMPANY

MANUFACTURE

The Safest, Most Economical, Compact and Durable High Pressure

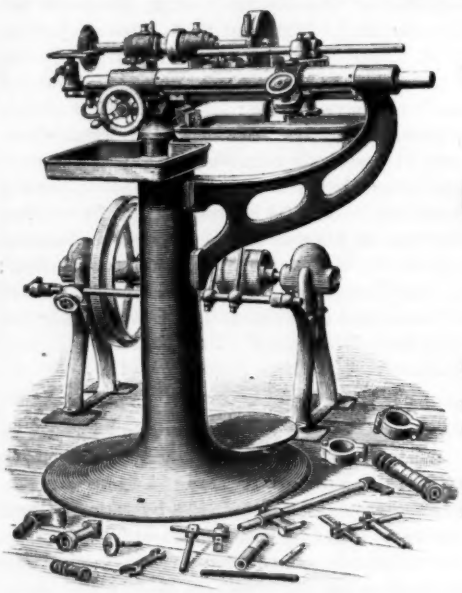
WATER TUBE BOILERS

All Wrought Steel. Large Mud Drum. Perfect Circulation.

By removing four manhole covers access is gained to every part of the boiler. Dry steam and great economy of fuel guaranteed.

GENERAL OFFICE: Pullman Bldg., Chicago. PITTSBURGH OFFICE: Lewis Block. NEW YORK OFFICE: 74 Cortlandt St.

Works: BARBERTON, SUMMIT COUNTY, OHIO.



$200.00

We take pleasure in announcing to be the price of the

No. 3 Universal

Cutter and Reamer Grinder.

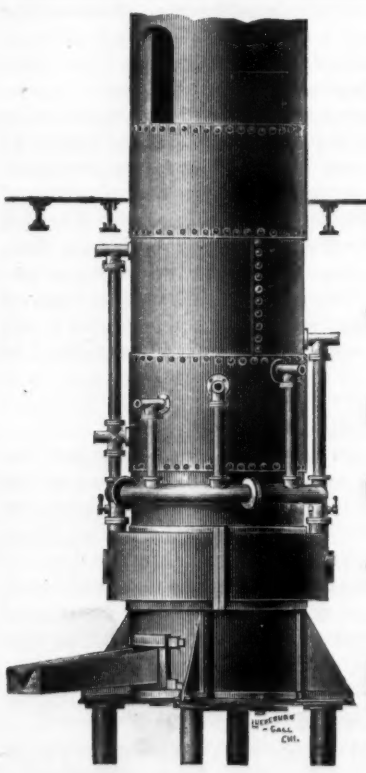
PREVIOUS PRICE, $260.00.

We have also reduced the prices of several other machines.

Our machines and tools are made with the intention that they shall be the best of their respective classes.

Brown & Sharpe Mfg. Co.,

PROVIDENCE, R. I.



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GREINER

Patent Economical

CUPOLA.

15 to 50 Per Cent. Saving in Fuel,

With Corresponding Increase in Quality of Iron Melted, Over any Existing Cupola.

15 Per Cent Saving Guaranteed.

Can be Applied to any Type of Cupola Now in Use.

400 IN USE IN EUROPE.
U. S. REFERENCES GIVEN.

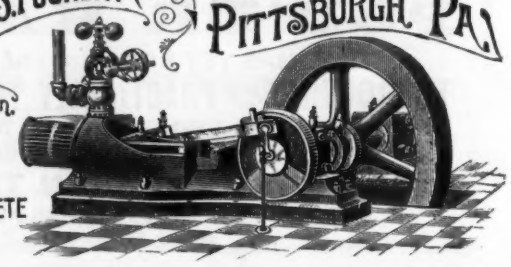
AGENTS WANTED.

UNGER AND WIGHAM,

301 Phenix Building, Chicago.

THE AETNA MEDIUM & HIGH SPEED ENGINE

Manufactured by THE TOTTEN & HOGG I. & S. FOUNDRY Co. PITTSBURGH, PA.



150 to 2000 H.P. Latest Design.
FOR ROLLING MILLS AND ALL OTHER WORKS WHERE LARGE POWER AND CLOSE REGULATION IS REQUIRED

CONTRACTS MADE FOR COMPLETE STEAM PLANTS.
ENGINES ALWAYS IN STOCK.

ENGRAVINGS

OF MACHINERY

And Manufactured Articles

~OF EVERY DESCRIPTION~

SEND PHOTO- OR DRAWING FOR ESTIMATE

UNION PHOTO-ENG CO.

2 S. WATER ST. CLEVELAND, OHIO.

TYPEWRITERS.

THE REMINGTON STANDARD TYPEWRITER

Is to-day, as it has ever been, the leading Typewriter.

Carefully tested improvements are constantly added to this famous machine.

TRY OUR PARAGON BRAND OF TYPEWRITER RIBBONS.

WYCKOFF, SEAMANS AND BENEDICT,
137 Superior St., Cleveland, O.

MICHIGAN

EMERY WHEEL CO.

194 Catherine St., Detroit, Mich.

Solid Emery & Corundum Wheels, to Run Wet or Dry, Special Shapes.

Perfection Saw Gummers.

SEND FOR PRICE LIST.

SPICER MANUFACTURING CO.,

New Philadelphia, O.

General Foundry and Machine Work, Heavy and Light Castings.

Privilege to make estimates solicited.

To Advertisers

If you wish to advertise

and need instruction, send one dollar for our "Book for Advertisers." A little study of that book will enable you to decide what you ought to do, and give an idea of the probable cost.

If you instruct us

to place a certain amount of advertising for you in the way we think will do you the most good, you should send an explicit statement of what you wish to accomplish, and make suitable arrangements for payment. Your order will then receive all the attention that it requires.

If you wish an advertisement

prepared and a plan of advertising marked out; to be told what papers you should use, and what the cost will be, we will furnish the advertisement and the plan—either or both, and submit them for your consideration, together with our bill for the service.

For preparing advertisements,

electrotypes and estimates the advertiser pays us. For the expense of placing advertisements and watching the fulfillment of contracts we are paid by a commission allowed by the publisher of the paper in which the advertisement appears.

If you want to learn

all the ins and outs of advertising without any cost or trouble, read PRINTERS' INK regularly, carefully, studiously; issued weekly, $2 a year.

If you wish a complete catalogue of all newspapers, send $5 for the American Newspaper Directory.

For any further information address

GEO. P. ROWELL & CO.,
Newspaper Advertising Bureau,
10 SPRUCE ST., NEW YORK.

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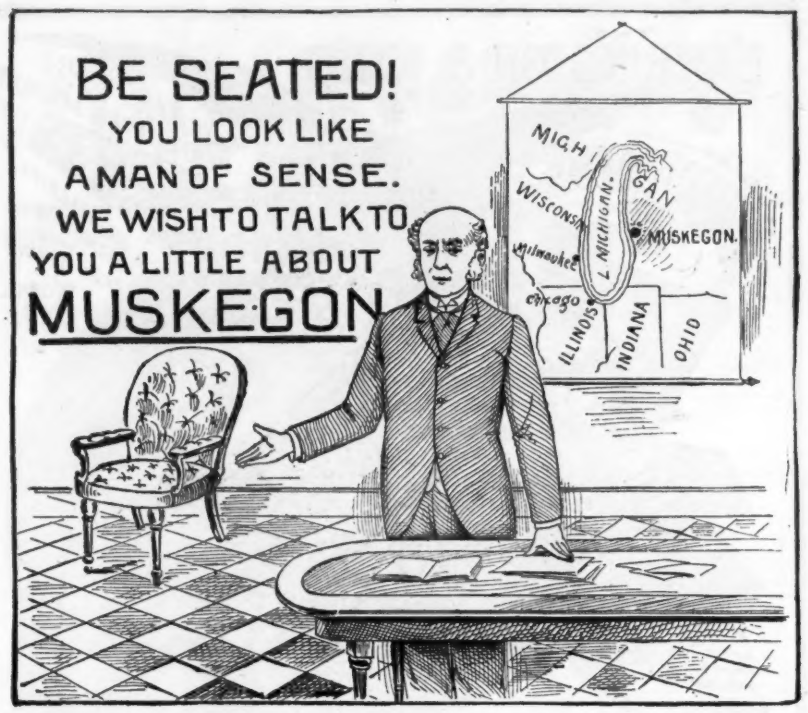


I wish to say to you that for the Manufacturer or Investor

THE CITY OF MUSKEGON, MICH.,

offers greater opportunities, has more real merit than ANY young City of the United States.

I AM aware that this is a BOLD STATEMENT, but I am prepared to give **Facts and Figures that will astonish you.** Notice this map on the wall, the Lake Michigan District, four States, having a common center (Lake Michigan). These four States, bordering on the **only** great body of water lying **wholly** within the United States, have an average age as States—61 years—and no district of the world ever made such a **record.** These four States: Illinois, Indiana, Michigan and Wisconsin, had, by the census of 1890, 9,781,255 population, or nearly **one-sixth** of the entire population of the Union; they have over **one-fifth** of the railway mileage of the United States, and over **one-tenth** of the railway mileage of the **world;** and talk about rapid growth—**Look at this table:**

NAME OF STATE.	GAIN LAST 30 YEARS.	PRESENT POPULATION—1890.
ILLINOIS	2,106,585	3,818,536
INDIANA	1,514,117	2,189,030
MICHIGAN	1,340,679	2,089,792
WISCONSIN	907,016	1,683 897
TOTAL	5,868,397	9,781,255

This 30 years gain—5,868,397—is MORE than the present ENTIRE POPULATION of the following FIFTEEN STATES, viz:

1	California	1,204,002
2	Colorado	410,975
3	Connecticut	745,861
4	Maine	660,251
5	Vermont	332,205
6	New Hampshire	375,227
7	Rhode Island	345,343
8	Delaware	167,861
9	Montana	131,769
10	Nevada	44,327
11	Washington	349,516
12	Utah	206,498
13	Oregon	312,490
14	North Dakota	182,425
15	South Dakota	327,848
	Total	5,796,598
16	West Virginia	760,448
17	Maryland	1,040,431
18	Florida	390,435
19	Idaho	84,229
20	New Jersey	1,441,017
21	Wyoming	60,589
22	New Mexico	144,862
	Total	9,718,609

NOTE:—

MICHIGAN, which is twenty years younger than Illinois or Indiana, made nearly

23 PER CENT.

of the entire gain of this four-state district for the last thirty years.

THE FOUR-STATE GAIN WAS 5,868,397.

The present population of this four-state district is 9,781,255 or MORE than the 22 opposite: ☞

See U. S. Census 1890.

NOTE.—Michigan gained more population in the last **30** years—see table above—**than the present entire population of Connecticut, Vermont and Delaware combined, or within 5,000 as much population as Oregon, Washington, Colorado, Montana and Nevada have combined.**

NOTE.—Michigan gained more population in the last **10** years than **Virginia and Georgia** together gained, or than **Kentucky and Tennessee,** or **Alabama and Mississippi** combined gained.

YOU ARE SURPRISED AT THIS.

It was your impression that all the growth and wealth of this district was at the south end of Lake Michigan, but let me tell you right here that the great intrinsic wealth is farther north, in the Iron, Copper, Salt and Timber district. The hardwood forests have scarcely been touched. Michigan puts out yearly over half the Iron Ore mined in the United States; more than all the Southern States combined. Nearly every pound of Steel made in Pennsylvania and Ohio is made from Ore coming from this district, (96.3 per cent of the Steel output of the United States for 1890 is accredited to six States lying along the **Great Lakes**) and this output was 100,000 tons more than that of Great Britain for 1889—**MICHIGAN FURNISHED THE ORE.**

When You Have Absorbed

THE

FOREGOING FACTS AND FIGURES

You are beginning to reach a point where you will appreciate the location of the City of

MUSKEGON.

Notice on this Map on the wall, and in the Cut below,

MUSKEGON'S CENTRAL LOCATION

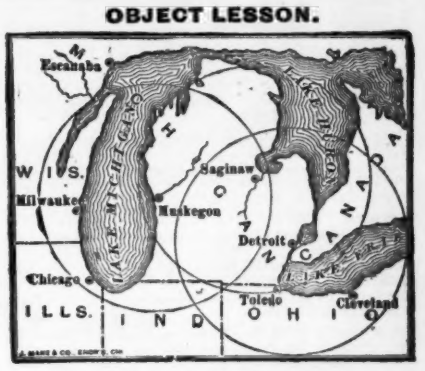
IN THIS GREAT

TEN MILLION POPULATION DISTRICT.

IT HAS THE BEST LOCATION IN MICHICAN.

LOOK AT THIS!

OBJECT LESSON.



3 MICHIGAN CIRCLES.
NAVIGATION CITIES.

Radius of Each Circle, 125 Miles.

POPULATION:—Each Circle has in round numbers in United States population as follows:

SAGINAW CIRCLE, - -	1,725,000
DETROIT CIRCLE, - - -	2,600,000
MUSKEGON CIRCLE, - -	2,725,000

NOTE.—See Cram's Atlas, Census 1890, by Counties.

The great business centers of this Lake Michigan District are the Coast Cities. Muskegon is third in size on this great body of water and has the finest natural inside Harbor on Lake Michigan, sixteen miles of water front, all available, deep water—114 miles from Chicago and 85 miles from Milwaukee, with which two cities navigation is open the year round. Only 175 miles by navigation from the greatest **Bessemer Ore** shipping docks in the **world.** Rare combination—**Raw Materials, Best Shipping Facilities and Best Markets** in the United States.

IT IS AN ACTUAL FACT that cargoes of heavy merchandise can be carried from **Muskegon** to the business center of **Chicago quicker** and for **less money** than the same quantity can be brought in **by rail** from points 10 to 15 miles outside the limits of Chicago. No experiment. Doing it now.

These great advantages are beginning to be appreciated. Twenty-one factories have been located in the last eighteen months. Among the factories secured are: **The Alaska Refrigerator Co., Large Rolling Mill, New Steel Works, Chase Bros. Piano Co., Sargeant's Invalid Chair Co., Nelson Piano Co., Mich. Washing Mach. Co., Malleable Iron Works, Machine and Foundry Co., Electric Alarm Co., Shaw Electric Crane Co., Houck Furniture Co., Electrical Power Co., Muskegon Cracker Co., Standard Oil Co. Barreling Works, Morton Key Seating Co., Kelly Bros. Mfg. Co., Heaps Earth Closet Co., Gray Bros. Mfg. Co., Hartshorn Shade Roller Co., New Flouring Mill**—All just completed or now building.

Why do you "CHASE RAINBOWS" on the outskirts of the Country, and invest at high prices, when you can get property near the great business center of the "Central West" for half the money, and having double the intrinsic worth?

A GOLDEN OPPORTUNITY IS BEFORE YOU.

THE MUSKEGON IMPROVEMENT CO., composed of leading citizens, have just commenced their **2nd Great Lot Sale. 2,000 Lots** at the uniform price of **$165 each,** location to be determined by allotment as soon as 50 per. cent. is paid in. **Terms of Subscription:** $15 down, balance $10 each month. $165 secures you a good lot, 50x125 feet, with alley in rear, in the phenomenal addition **"MUSKEGON HEIGHTS,"** which addition is pronounced by Real Estate Experts to be as fine an addition as any city in this country can show. It is less than one and one-half miles from the business center of the City of Muskegon, with which it is connected by handsome, paved streets and an Electric Street Railway. This addition has twelve **large** factories located upon it **now;** has good Hotel, Brick Blocks and Stores, Depot, three paved streets, a large number of good residences. Every lot is level and desirable. **There is not a lot on the addition worth less than the price asked.** The net avails of this sale to be used to locate ten more factories. All the factories on Muskegon Heights are solid, substantial brick structures, the smallest is 50x150 feet, 2 stories; the largest plant is two buildings, each 60x400, one 2 stories, the other 3 stories high; the latter plant is owned by four Bank Presidents and is the largest factory of its kind in the world. **DON'T MISS THIS OPPORTUNITY. Such chances for sure paying investment are rare.**

If you wish to subscribe, remit by Money Order, P. O. or Express, or Bank Draft, to

F. H. HOLBROOK, Sec'y Board of Trade, or

HOLBROOK & McDONALD, SALES AGTS.,

MUSKEGON IMPROVEMENT CO.

REFERENCES: Any Bank in the City of Muskegon. Send for Maps, Plats and Information.

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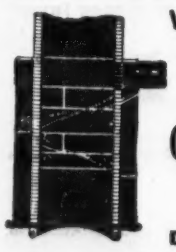

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Cold-Rolled Smooth Finished.

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We are producing a specially good quality of Roofing Material of all kinds. Our Steel standing seam quality is flat and smooth and when laid looks as well as a tin roof. All standing seam quality sheared on Squaring Shears.

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We have five sheets mills producing one thousand tons per month and can invariably fill orders with reasonable promptness. We make all gauges from No. 10 to No. 30, and can roll to 36 in. wide. Inquiries will receive careful and prompt attention and we solicit your correspondence. Visitors are always welcome and accorded courteous treatment.

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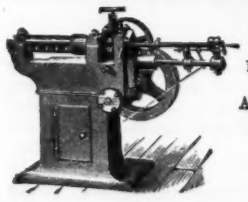

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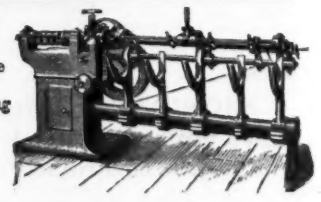

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Our corrugated or plain Iron or Steel **SHUTTERS** and **DOORS** will render it Fire and Burglar Proof. We also cover wooden shutters and doors with flat painted sheets, either plain or with corduroy corrugations. For prices, etc., address

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And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

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MANUFACTURERS OF

BESSEMER STEEL RAILS,

Blooms and Billets, Steel Angles, Forgings, Bar and Spring Steel. Steel Street Rails, Steel Oil Barrel Hoops, Wire of all Kinds, Iron and Steel Boiler Plates, Galvanized and Black Sheet Iron, Corrugated Iron Roofing, Sheet Steel.

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CLEVELAND (f. o. b. cars, net cash) Bessemer, $17 30; No. 1 Foundry, $16 80; No. 2 Foundry, $15 80; No. 1 Gray Forge, red short, $14 80; No. 2 Gray Forge, neutral, $14 30; No. 1 American Scotch, $16 80; No. 2 American Scotch, $15 80.

CHICAGO (reported by Messrs. Rogers, Brown & Merwin): Southern Coke No. 1 foundry, $16 25@17 00; Southern Coke No. 2 Foundry, $15 25@16 00; Southern Coke No. 3 Foundry, $14 75@15 50; Southern Coke No 1, Softeners, $15 25@16 00; Southern Coke No. 2, Softeners, $14 50@15 25; Ohio Silveries No. 1, $17 50@18 50; Ohio Silveries No. 2, $16 50@ 17 50; Ohio Strong Softeners No. 1, $18 00@19 00; Ohio Strong Softeners No. 2, $17 25@18 25; Lake Superior Charcoal Nos. 1 to 6, $17 75@18 50; Tennessee Charcoal No. 1, $18 00@19 00; Tennessee Charcoal No. 2, $17 00@18 00; Southern Standard Car Wheel, $21 00@23 00; Tennessee Standard Car Wheel, $00 00@00 00.

CINCINNATI (reported by Rogers, Brown & Co.): FOUNDRY IRONS—Southern Coke, No. 1 foundry, $15 00@15 50; Southern coke, No. 2 and No. 1 soft, $14 00@$14 25; Hanging Rock Coke, No. 1 foundry, $16 50@17 50; Jackson Co. Stone Coal, No. 1 foundry, $16 50@17 00; Tennessee Charcoal, No. 1 foundry, $17 00@17 50; Hanging Rock Charcoal, No. 1 foundry, $20 00@22 00. MILL IRONS—Standard Southern Coke, grey forge, $12 75@13 00; Standard Southern Coke, mottled, $12 50@12 75; Cold Short Southern Coke, grey forge, $12 75@13 00; Strong Ohio Neutral Coke, grey forge, $15 00@15 50. CAR WHEEL AND MALLEABLE—Standard Alabama Car Wheel, $19 50@20 50; Tennessee Car Wheel, $18 00@19 00; Lake Superior Car Wheel, $19 50@20 50.

BUFFALO (reported by Rogers, Brown & Co.): Mahoning and Shenango Valley strong, No. 1 Foundry, $16 00@17 50; Mahoning and Shenango Valley strong, No. 2 Foundry, $15 00@16 50; Ohio Softener No. 1, $16 25@16 75; Ohio Softener No. 2, $15 25@15 75; Jackson Co., Silvery No. 1, $18 00@00 00; Jackson Co. Silvery, No. 2, $17 00@00 00; Lake Superior Charcoal, $18 50@00 00; Tennessee Charcoal, $18 00@19 00; Southern Softener No. 1, $16 25@00 00; Southern Softener No. 2, $15 50@15 75; Southern Strong No. 1 Foundry, $16 75@00 00; Southern Strong No. 2 Foundry, $16 25@00 00' Alabama Car Wheel, $19 75@21 75; Hanging Rock Charcoal, $21 00@22 00.

LOUISVILLE (reported by Hall Bros. & Co.) HOT BLAST FOUNDRY—Southern coke No. 1, $14 25@14 50; Southern coke No. 2, $13 50@14 00; Southern coke No. 3, $13 00@13 25; Mahoning Valley (Lake ore mixtures), $00 00@00 00; Southern charcoal, No. 1, $16 00@17 00; Southern charcoal, No. 2, $15 50@16 00; Missouri charcoal, No. 1, $17 00@17 50; Missouri charcoal, No. 2, $16 50@17 00. FORGE—Neutral coke, $12 50@12 75; Cold short, $12 25@12 50; Mottled, $11 75@12 00. CAR WHEEL AND MALLEABLE—Southern (standard brands), $19 00@19 50; Southern (other brands), $17 00@18 00; Lake Superior, $20 00@21 00.

ST. LOUIS (reported by Rogers, Brown & Meacham): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $15 50@15 75; Southern Coke No. 2, $14 50@14 75; Southern Coke No. 3, $13 75@14 25; Southern Grey Forge, $13 25@13 50; Southern Charcoal No. 1, $17 25@17 75; Southern Charcoal No. 2, $16 75@17 25; Missouri Charcoal No. 1, $15 50@16 00; Missouri Charcoal No. 2, $15 00@15 50; Ohio Softeners, $18 00@19 00. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $19 50@20 00; Southern, $19 50@20 00. CONNELLSVILLE COKE—East St. Louis, $0 00; St. Louis, $5 65.

DETROIT (reported by William F. Jarvis & Co.): Lake Superior Charcoal, all Numbers, $18 00@18 50; Lake Superior (coke) Bessemer, $16 50@17 00; Katahdin (Maine charcoal), $00 00@00 00; Lake Superior Coke, Foundry, all ore, $17 50@18 00; Lake Superior Coke, Foundry, all ore, $00 00@00 00; Standard Ohio Black Band, $18 00@18 50; Southern No. 1 $16 25@16 50; Southern Gray Forge, $14 00@14 50; Jackson County (Ohio) Silvery, $18 25@18 75; Old Car Wheel, $00 00@00 00. Connellsville Coke, $0.00.

LOUISVILLE (reported by Geo. H. Hull & Co.): Southern Coke No. 1 Foundry $14 50@15 00; Southern Coke No. 2 Foundry $13 25@13 75; Southern Coke No. 3 Foundry $12 75@13 25; Grey Forge, $12 50@12 75; Southern Coke Silver Grey, $00 00@00 00; Southern Charcoal No. 1 Foundry, $16 00@17 00; Car Wheel, $18 00@20 00.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $16 00@16 25; No. 2 Foundry, $15 00@15 25; Grey Forge, $13 50@13 50; White and Motfled, $13 00@13 25; Warm Blast Charcoal, $18 00@22 00; Cold Blast Charcoal, $22 00@26 00; Bessemer, $15 00@15 25.

MERCHANT IRON AND STEEL.

Flat Bar

1½ to 4 by ⅜ to 1 inch	1 80
4½ to 6 by ⅜ to 1 inch	1 90
1½ to 6 by 1¼ to 2 inch	2 20
1¼ & 1½ by ⅜ to ¾ inch	1 90
1 & 1¼ by ⅜ to ¾ inch	2 00
⅝, ¾ and ⅞ by ⅜ to ⅝ inch	2 20

Round and Square.

1 to 1¾ inch	1 80
2 to 2¾ inch	2 00
2¾ to 3¼ inch	2 30
3¼ to 4 inch	2 80
4¼ to 4½ inch	3 30
4¾ to 5 inch	3 50

Oval.

¼ to 1¼ inch	2 20
⅝ to ¾ inch	2 40
⅞	2 60
1	3 00

Half Oval and Half Round.

¼ to 3 inch	2 90
⅝ to 1¼ inch	2 50
⅝ to ¾ inch	3 10
⅞	3 30
1	4 80

Heavy Band.

¼ to 6 by ¼ and 5-16 inch	2 00
¼ to 1¼ by ¼ and 5-16 inch	2 10
⅜ to ⅞ by ¼ and 5-16 inch	2 30
to ⅝ by ⅜ and 5-16 inch	2 80

Hoops.

1¼ to 4, Nos. 13 to 15	2 60
1¼ to 2, Nos. 16 to 18	2 70
1¼ to 2, No. 19	2 80
1¼ to 2, No. 20	2 90
1¼ to 2, No. 21	3 00
1¼ to 2, No. 22	3 10
15-16, 1 and 1⅛, Nos. 13 to 15	2 80
15-16, 1 and 1⅛, Nos. 16 to 18	2 90
15-16, 1 and 1⅛, Nos. 19 and 20	3 00
15-16, 1 and 1⅛, No. 21	3 10
15-16, 1 and 1⅛, No. 22	3 20
⅞, Nos. 13 to 15	3 00
⅞, Nos. 16 to 18	3 10
⅞, Nos. 19 and 20	3 20
⅞, No. 21	3 30
⅞, No. 22	3 40
13-16, Nos. 13 to 15	3 20
13-16, Nos. 16 to 18	3 30
13-16, Nos. 19 and 20	3 40
13-16, No. 21	3 50
13-16, No. 22	3 60
¾, Nos. 13 to 15	3 30
¾, Nos. 16 to 18	3 50
¾, Nos. 19 and 20	3
¾, No. 21	3
¾, No. 22	3
11-16, Nos. 13 to 15	3
11-16, Nos. 16 to 18	3
11-16, Nos. 19 and 20	3
11-16, No. 21	3
11-16, No. 22	4
⅝, Nos. 13 to 15	3
⅝, Nos. 16 to 18	4
⅝, Nos. 19 and 20	4
⅝, No. 21	4
⅝, No. 22	4
⅝, No. 23	4

Light Band.

1¼ to 6 by ⅛ to 3-16 in	2 20
1¼ to 6 by Nos. 11 and 12	2 30
1 to 1¼ by ⅛ to 3-16 in	2 40
1 to 1¼ by Nos. 11 and 12	2 50
⅞ and 13-16 by ⅛ to 3-16 in	2 70
⅞ and 1 3-16 by Nos. 11 and 12	2 80
¾ and 11-16 by ⅛ to 3-16 in	3 00
¾ and 11-16 by Nos. 11 and 12	3 10
⅝ and 9-16 by ⅛ to 3-16 in	3 30
⅝ and 9-16 by Nos. 11 and 12	3 40
½ by ⅛ to 3-16 in	3 60
½ by Nos. 11 and 12	3 70

Wagon Box Iron.

⅝ inch, beveled edge, by Nos.	11 and 12		2 80
⅝ inch, " " "	13 and 14		3 00
¼ inch, " " "	11 and 12		3 10
¼ inch, " " "	13 and 14		3 30

Sheet Iron:

No. 10 to 14	2 65
No. 15 to 17	2 75
No. 18 to 21	2 99
No. 22 to 24	3 15
No. 25 to 26	3 30
No. 27	3 40
No. 28	3 50

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 60
C No. 1, " "	2 85
C H No. 1 " "	3 10
C H Flange, " "	3 85
Extra Flange, "	4 35
Solid Fire Box "	5 10

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 75
Shell	3 15
Flange	3 45
Marine Flange	3 85
Fire Box	4 55

Above includes plates 90 inches wide.

90 to 96 in. wide	¼c lb extra
96 to 100 in. wide	1 c "
100 to 104 in. wide	1¼c "
104 to 116 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. lbs
1 to 2 in. inclusive	09
9-16 to ½ in "	09
7-16 to ⅝ and 2⅜ to 3 in	10¼
3⅛ to 4 in	11
⅜ to 11-16 and 4¼	10¼
⅛ to 6 in	11¼
¼ to 9-32 and 6⅛ to 7 in	12
3-6 in	14

Flats.

	cts. lbs
2 to 9-16 wide by 2 to ⅛ thick	8

Bessemer and O. H. Steel.

Machinery	base price,	2 75
Tire	"	2 75
Spring	"	3 25
Sleigh Shoe	"	2 75
Toe Calk	"	3 00
Cutter Shoes, tapered and burr.	"	3 00

English Tool Steel.

Jessop's	16c
Hobson's "Best"	16c
" "Choice"	36c

Burden Boiler Rivets.

⅛, ¾, 11-16 and ½ inches diameter	4 00
Bridge ⅛, ¾, 11-16 and ½ inch diam	4 00

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	NET TONS
No. 1 R. R. wrought scrap	$18 00
No. 1 wrought scrap	16 50
No. 1 Machine cast scrap	11 50
Iron axles	23 50
Axle turnings	13 50
Wrought turning (free from cast)	11 50
Cast borings	8 00
Uncut wrought iron boilers	11 50
Steel boiler plates	16 00
Grate Bars	8 00
Pipes and flues (Clean)	12 00
Tank iron	12 50
Hoop and band iron	9 50
Sheet iron	8 50
Wrought drillings	11 00
Malleable iron	9 50

Reported by Messrs. BLACK & POLLOCK, Cincinnati, O.:

Railroad Wrought	$20 00
No. 1 Country Wrought	17 00
Stove Plate	8 75
Machine Castings	11 00
Hoop and Sheet	8 00
Casting Borings	9 00
Wrought Turnings	12 00

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CAMBRIDGE REFINED IRON. TRADE MARK

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CAPACITY RANGES FROM No 30 TO 26 INCHES WIDE TO 1-4×40×120

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MINERS AND SHIPPERS OF

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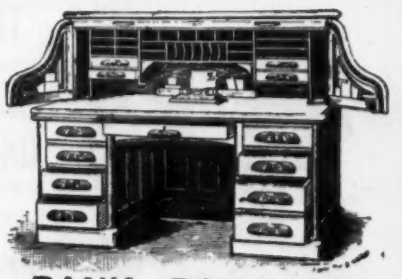

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Moulders'.....dis 40@40&10
Hand.....dis 40&10@50

Belting.

Boston Belting Co's standard.....dis 70
" " " extra.....dis 60&5
" " " best.....dis 55
Hoyt's Short Lap.....dis 45
Cleveland Rubber Co. extra standard..dis 60&10
Shults Raw Hide Leather Belting, single.....dis 40
Shults Raw Hide Leather Belting, double and Light Double.....dis 40
Standard, oak tanned.....dis 50&10
Alexander Brothers' pure oak tanned. ...dis 45

Blowers and Exhausters.

B. F. Sturtevant's.....dis 20
Boston Blower Co.,.....dis 35
Buffalo.....dis 35

Borax.

.....₩ D12

Chalk.

White.....₩ gross 50
White Crayon.....₩ gross 12@12½ dis 10
Red.....dis 70
Blue.....dis 65

Chucks.

Cushman's 4 Jaw Independent.....dis 45
" Combination.....dis 40
" Geared Scroll.....dis 30
" 2 Jaw Brass Workers.....dis 30
" Drill.....dis 35
Wescott's Scroll Combination.....dis 33⅓
" Independent.....dis 40
" Little Giant Drill.....dis 30
Horton's Universal.....dis 40
" Independent.....dis 45
Whiton's Independent.....dis 45
National Combination.....dis 40
Sweetland " .....dis 40
Almond Drill.....dis 20
Morse " .....dis 15
Skinner's Combination Lathe.....dis 33⅓
" Independent Lathe.....dis 40
" Universal Lathe.....dis 40
" Drill.....dis 15

Cutters and Reamers.

Cleveland.....dis 10@15
Pratt & Whitney.....dis 10@15
Standard.....dis 10@15
Brown & Sharpe, Milling Cutters.....dis 15
Gear Cutters.....dis 15

Crowbars.

Cast Steel.....₩ D4
Iron, steel points.....₩ D 3¼

Drill and Drill Sockets.

Twist drills.....dis 50&10
Morse Taper and Straight shank to 1¾".....dis 50&10
Morse Taper and Straight shank Larger than 1¾".....dis 25
Drill Sockets.....dis 25
Standard Twist Drills.....dis 55@55&5
Cleveland " .....dis 55@55&5

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	No. 4 to 46 gr.	No. 54 to 150. gr.	Flour, F.	C. F. FF.
Kegs, ₩ D.	4 c	5 c		2½c
¼ kegs ₩ D.	4¼c	5¼c		2¾c
⅛ kegs ₩ D.	4½c	5½c		3 c
9 D cans, 10 in case	6 c	6½c		3 c
9 D cans, less than 1	10 c	10 c		7½c

Emery Cloth and Paper.

Sarder, Adamson & Co.....dis 45@50
H. H. Barton.....dis 50@50&10

Emery Wheels.

Detroit.....dis 55@60
Norton's.....dis 55@60
Grant.....dis 55@60
Sterling.....dis 60
Celluloid.....dis 10&33⅓
Northampton.....dis 55
Crystal.....dis 65@70
Vitrified.....dis 60
Vulcanite.....dis 10&10

Files.

Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
Arcade.....dis 60&10@60&10&10
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50
ndustry File Works, hand cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list.....dis 70

Nuts and Washers.

Size of bolt inches	⅜	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	2¾
Hexagon	15½	11½	8½	6	5¾	5½	5
Washers	9	8	7	5	4½	4¼	4¼

In lots less than 100 lbs, ₩ D add ½c., 1D boxes add 1c to list.

Nails (wire.

List July 14, 1887.....dis 70 &10
Standard Penny Nails, ₩ keg card rate { Car lots.....$2.30 / Less than car lots $2.40

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.50; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Packing, Steam.

Boston Belting Co.....dis 60
American Packing Hemp.....₩ D10@11
Russia Packing " .....₩ D14
Italian Packing " .....₩ D13@14
Plumbago Piston.....₩ D40
Morrison's " .....₩ D50
Square Flax " .....₩ D50
Sheet Rubber.....₩ D12&24
Excelsior Rubber.....₩ D48

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 45
Medart Pulleys.....dis 55
Split Wood Pulleys.....dis 50@55

Rivets.

Iron, Thousand, list November 17, ...dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17.....dis 50
Copper.....dis 50@50&10

Rope.

Manilla, ½ inch and over.....₩ D15¼
Sisal, ½ inch and over.....₩ D13¼

Sand Paper.

B. A. & Co.....dis45@50
H. H. Barton's.....dis40@45
New England Flint.....dis 40@50
Barton's Garnet.....dis 20

Saws.

Disston's Circular.....dis 40@10
" Band.....dis 20
" Scroll.....Net
Hack Saw Stubs.....dis 20
" " Eureka.....dis 20
" " Star.....dis 20
Saw Swages Disston's.....dis 30
Atkins' Circular Saws.....dis 40&45
" Mill, Mulay and Drag Saws..dis 40&10
" Wood Saws.....dis 40&10
" Silver Steel Diamond Cross-cut Saws.....dis 70c per ft
" Dexter Cross-cuts.....dis 50c "
" Diamond " .....dis 30c "
" Tuttle Tooth Cross-cuts..dis 25c "
" One-man Cross-cuts.....dis 33c "
No. 1 Handles.....dis 23c per pair
No. 6 " .....dis 16c "
Excelsior Saw Tools.....$6 per doz
Perfection " .....$15 "
Detroit Saw Works, Circular.....dis 50
" " " Band.....dis 25
" " " Mulay.....dis 45

Screws.

Wood Screws—New List 1890.

Flat head iron.....dis 72½
Round head iron.....dis 67½
Flat head brass.....dis 72½
Round head brass.....dis 65
Square Cap.....dis 65
Hexagon Cap.....dis 60
Set C. H. C. P.....dis 70
Machine, flat head, iron.....dis 65
Machine, round head, iron.....dis 60
Bench and hand—
Lag or coach.....dis 75@75&10
Coach, patent gimlet point.....dis 75

Shovels and Spades.

Ames' list November 1, 1885.....dis 20
Dennis.....dis 5.25
Hussey & Binns, railroad.....dis 8.00

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 50
Pulley Taps.....dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ½ lb Balls	21c@29c	
No. 18 " " ¼ and ½ "	18c@28c	
No. 36 " " ¼ and ½ "	16c@27c	
2-Ply Hemp, ¼ & ½ lb Balls (Spring Twine	11½c	
3-Ply " 1 lb Balls	12@12½c	
3-Ply " 1½ lb Balls	11@11½c	
Cotton Wrapping, 5 Balls to lb	15@16c	

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 15@20
Howard.....dis 25

Wire.

New List, Jan. 18, 1884

Brass and copper.....dis 20@25
Bright and annealed, Nos. 0@18...dis 70&10@75
" " Nos. 19@26..dis 75@75& 5
" " Nos. 27@36..dis 75&10& 5
Coppered Nos. 0 to 18, market list..dis 70@70& 5
Galvanised Nos. 0 to 18 " " .....dis 65&5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire, regular.....$6.00 lb dis 1

Wrenches.

Coe's genuine, ...dis 50
Girard Standard.....dis 70&10
Agricultural.....dis 75&10
Mechanics'.....dis 55&10,& 2
Bemis & Call's Combination .....dis 35
Donohue's Engineers.....dis 20&10
Lamson & Sessions Engineers.....dis 60
Billings & Spencer's Drop Forged.....dis 25
William's " " .....dis 25
Alligator " " .....dis 50

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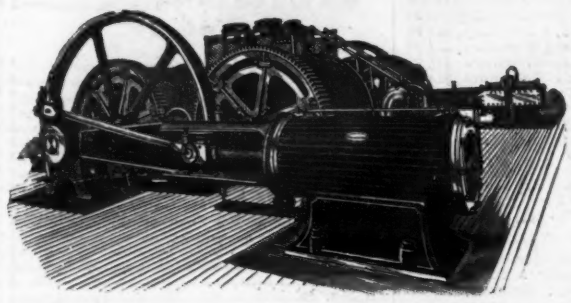

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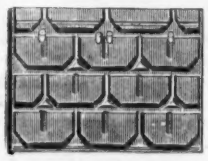

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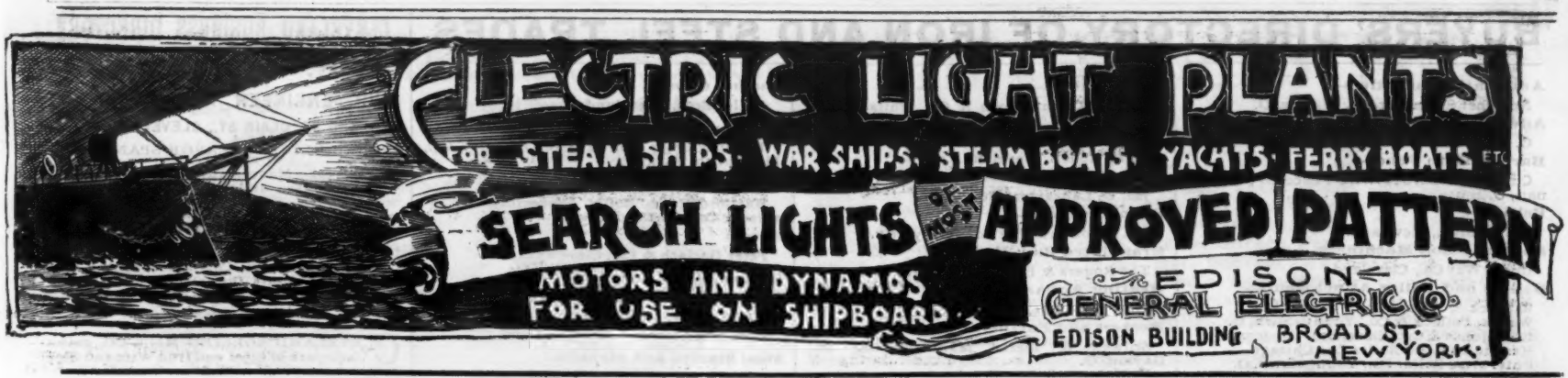
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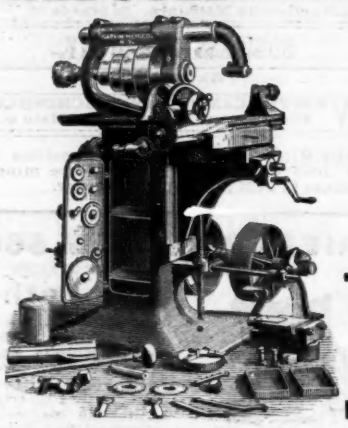

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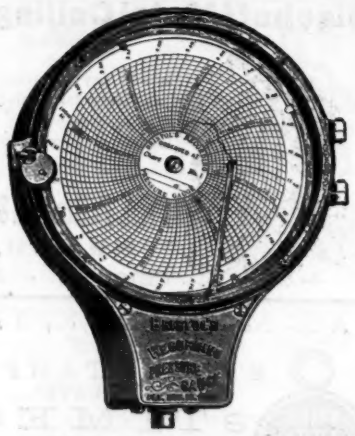

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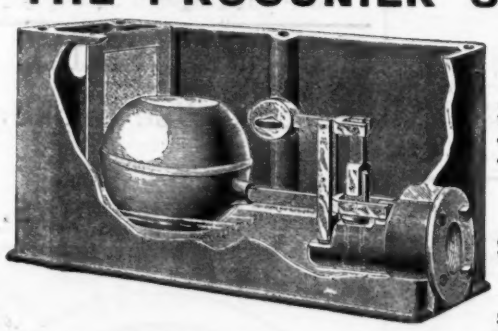

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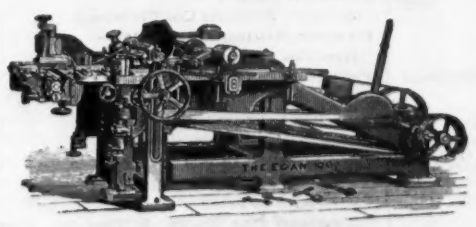

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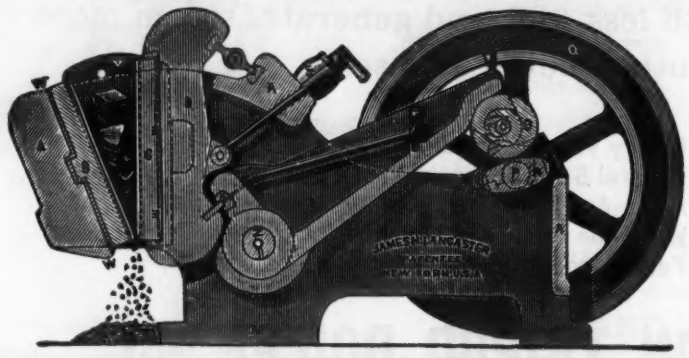

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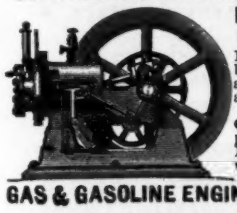

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Kent—6:50 a. m., 3:00 p. m., *5:45 p. m. 6:20 p. m.
Bedford—6:50 a. m., 11:10 a. m., 1:30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m. 10:35 p. m.
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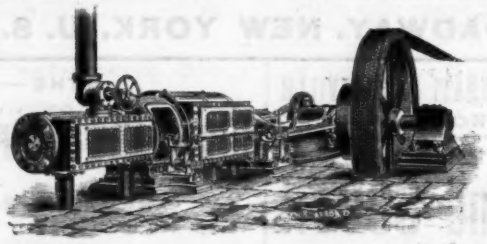

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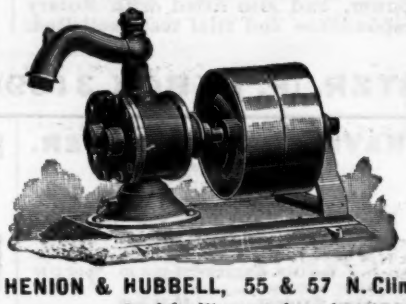

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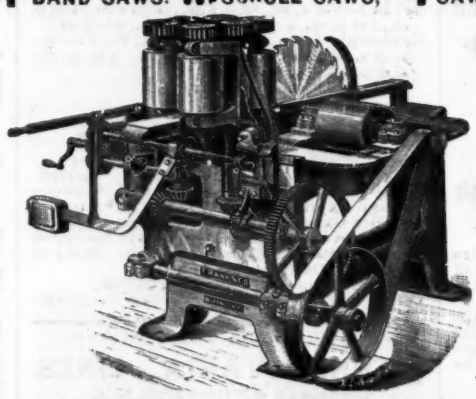

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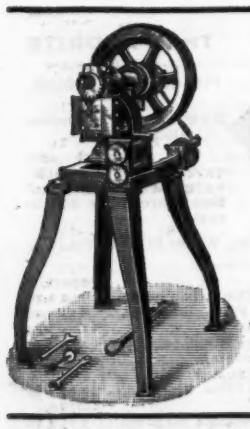

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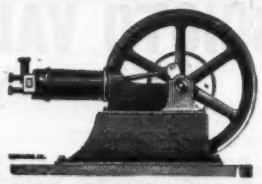

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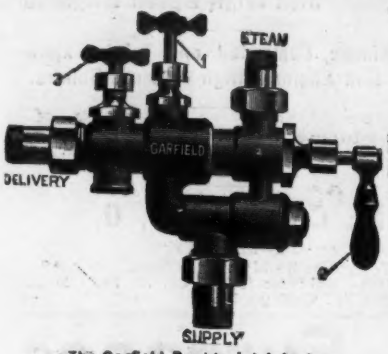

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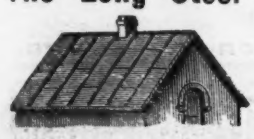

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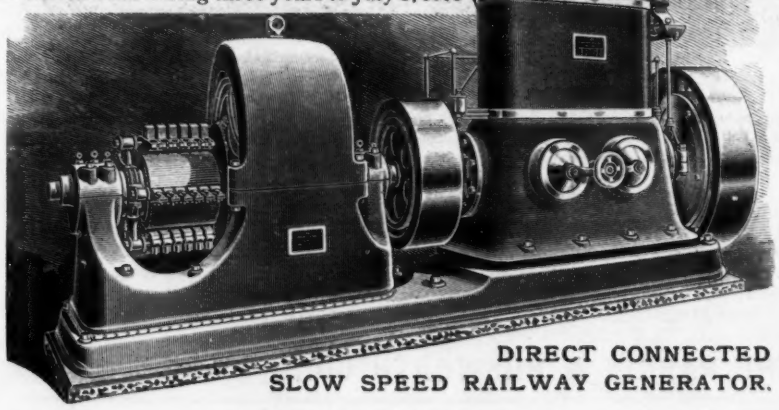

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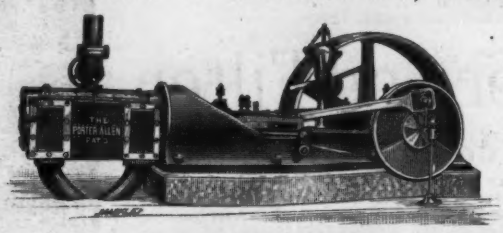

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ALSO BUILDERS OF
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Twenty Horse Power:		Twenty Five Horse Power:	
Diameter of Shell	36 in.	Diameter of Shell	38 in.
Diameter of Tubes	3 in.	Diameter of Tubes	3 in.
Length of Tubes	8 ft.	Length of Tubes	8 ft.
Number of Tubes	36	Numbes of Tubes	42
Fire Box, Height	36 in.	Smoke Box	18 in.
Width	36 in.	Fire Box Height	39 in.
Length	48 in.	Width	38 in.
Dome, Diameter	28 in	Length	52 in.
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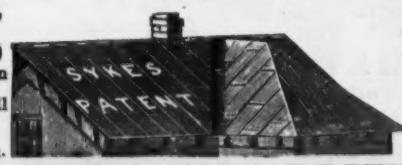

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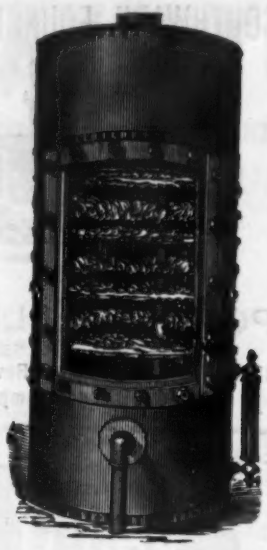

This cut is the fac simile of the appearance of the shelves o. a No. 5 Heater at work on ordinary lime-water when the door was removed after the Heater had been running two weeks.

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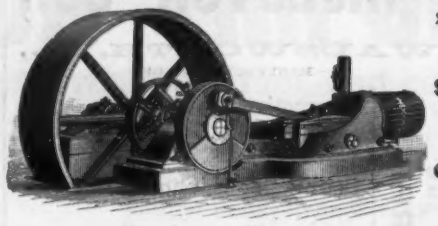

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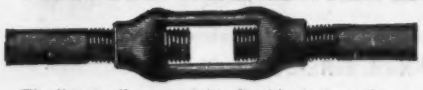

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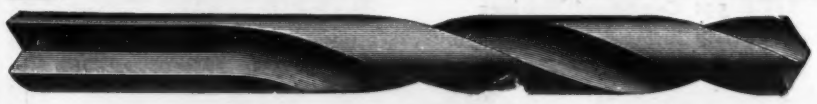

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